May-June, 1955

Communications—Electronics—Photography

SIGNAL

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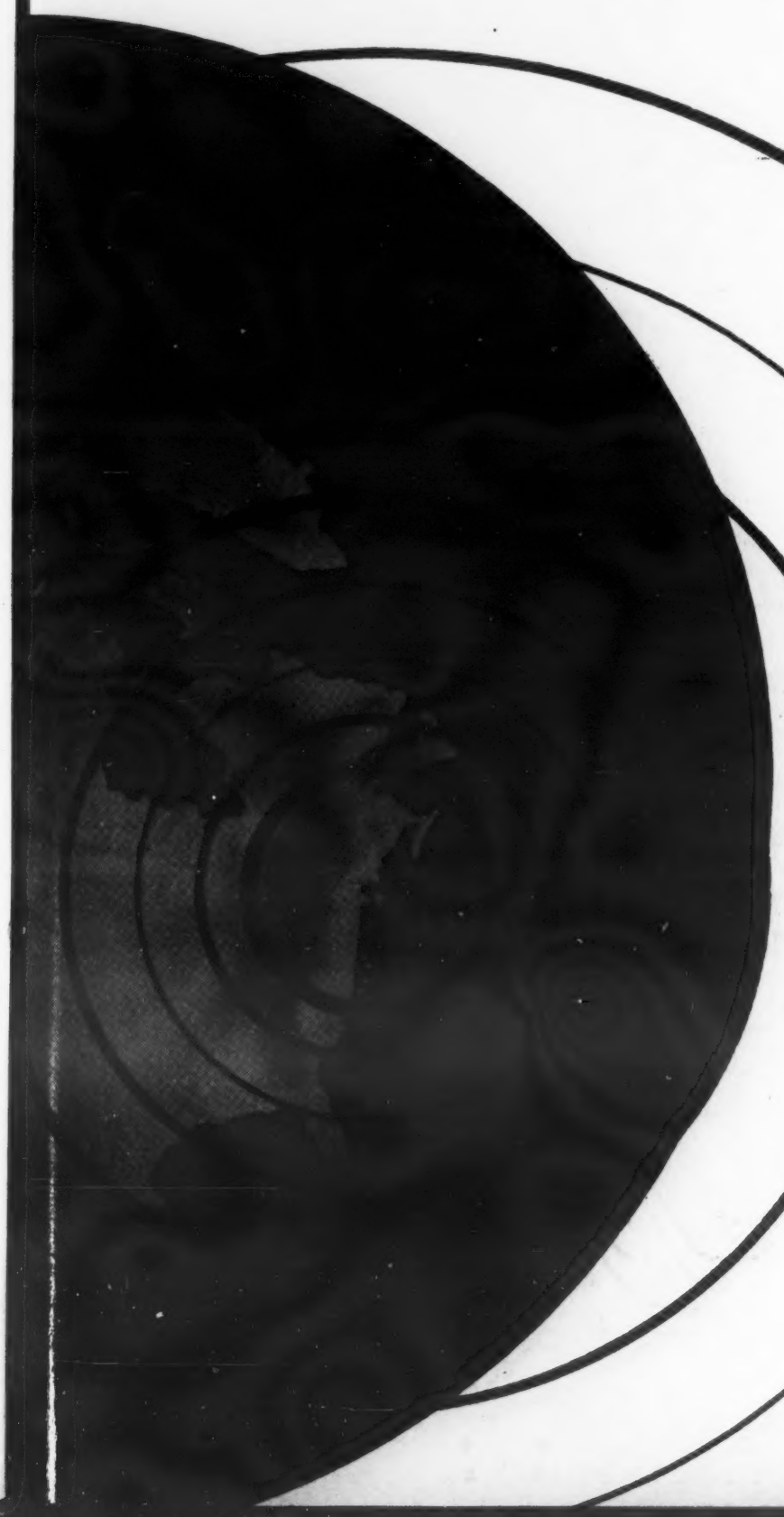
MAY 20

Featuring Global Communications



Souvenir Program Issue

Including the "Exhibition-in-Print"

☆ ☆ ☆

9th Annual AFCEA Convention

May 19-20-21, 1955

New York City, N. Y.

Fort Monmouth, N. J.

☆ ☆ ☆

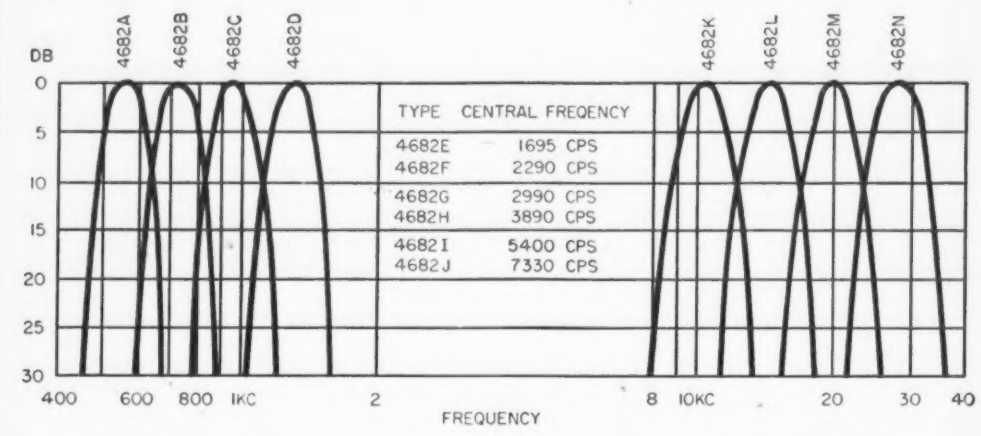
Program on Pages 64 and 65

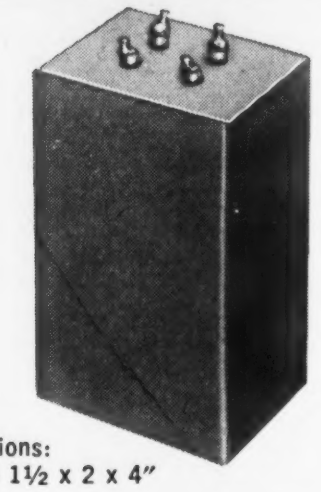
OUR MILLIONTH FILTER SHIPPED THIS YEAR...

FILTERS
FOR EVERY APPLICATION

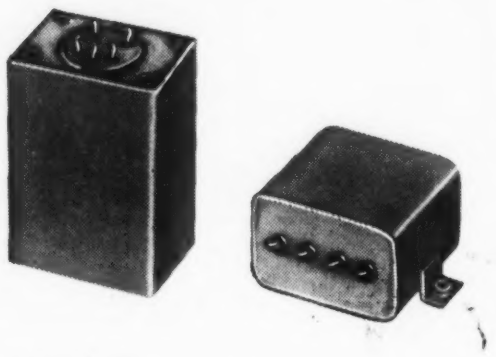
TELEMETERING FILTERS

UTC manufactures a wide variety of band pass filters for multi-channel telemetering. Illustrated are a group of filters supplied for 400 cycle to 40 KC service. Miniaturized units have been made for many applications. For example a group of 4 cubic inch units which provide 50 channels between 4 KC and 100 KC.

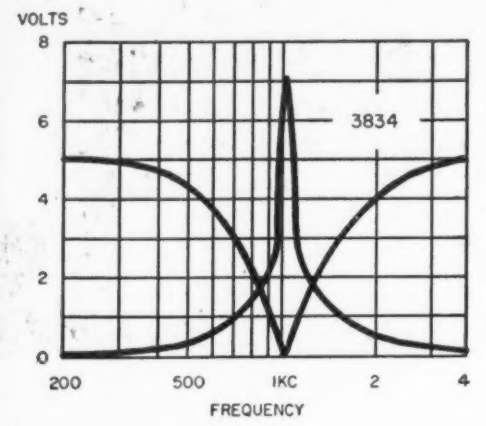


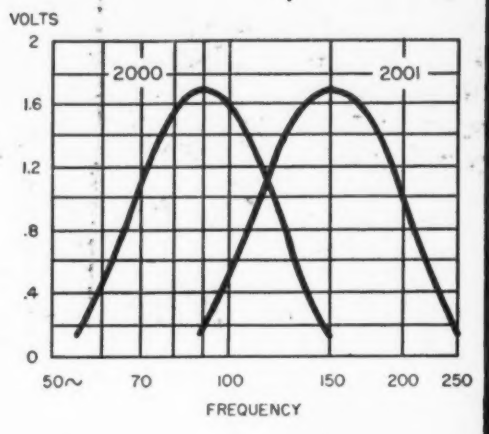


Dimensions:
(4682A) 1½ x 2 x 4"



Dimensions:
(3834) 1¼ x 1¾ x 2-3/16".
(2000, 1) 1¼ x 1¾ x 1⅝".





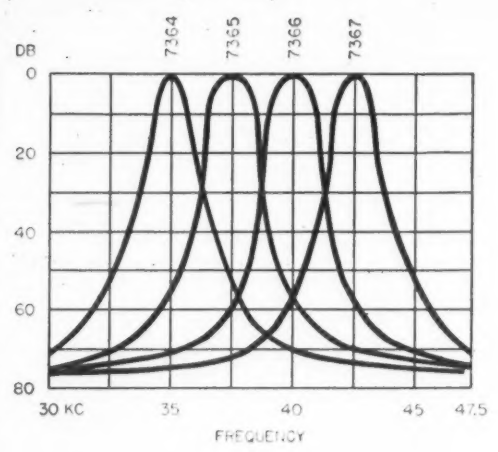
AIRCRAFT FILTERS

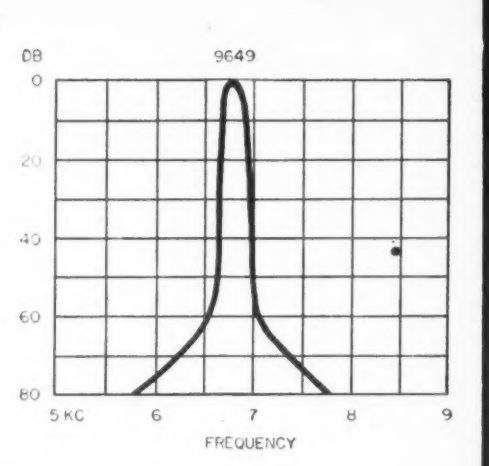
UTC has produced the bulk of filters used in aircraft equipment for over a decade. The curve at the left is that of a miniaturized (1020 cycles) range filter providing high attenuation between voice and range frequencies.

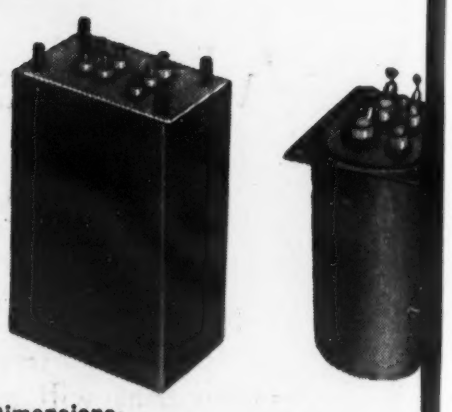
Curves at the right are that of our miniaturized 90 and 150 cycle filters for glide path systems.

CARRIER FILTERS

A wide variety of carrier filters are available for specific applications. This type of tone channel filter can be supplied in a varied range of band widths and attenuations. The curves shown are typical units.



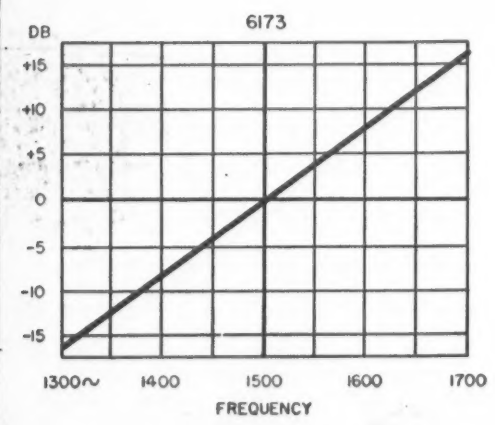


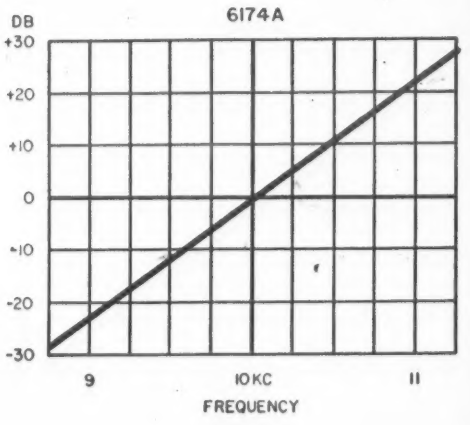


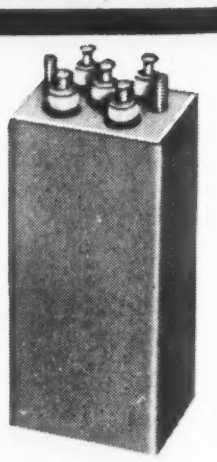
Dimensions:
(7364 series) 1⅝ x 1⅝ x 2¼".
(9649) 1½ x 2 x 4".

DISCRIMINATORS

These high Q discriminators provide exceptional amplification and linearity. Typical characteristics available are illustrated by the low and higher frequency curves shown.





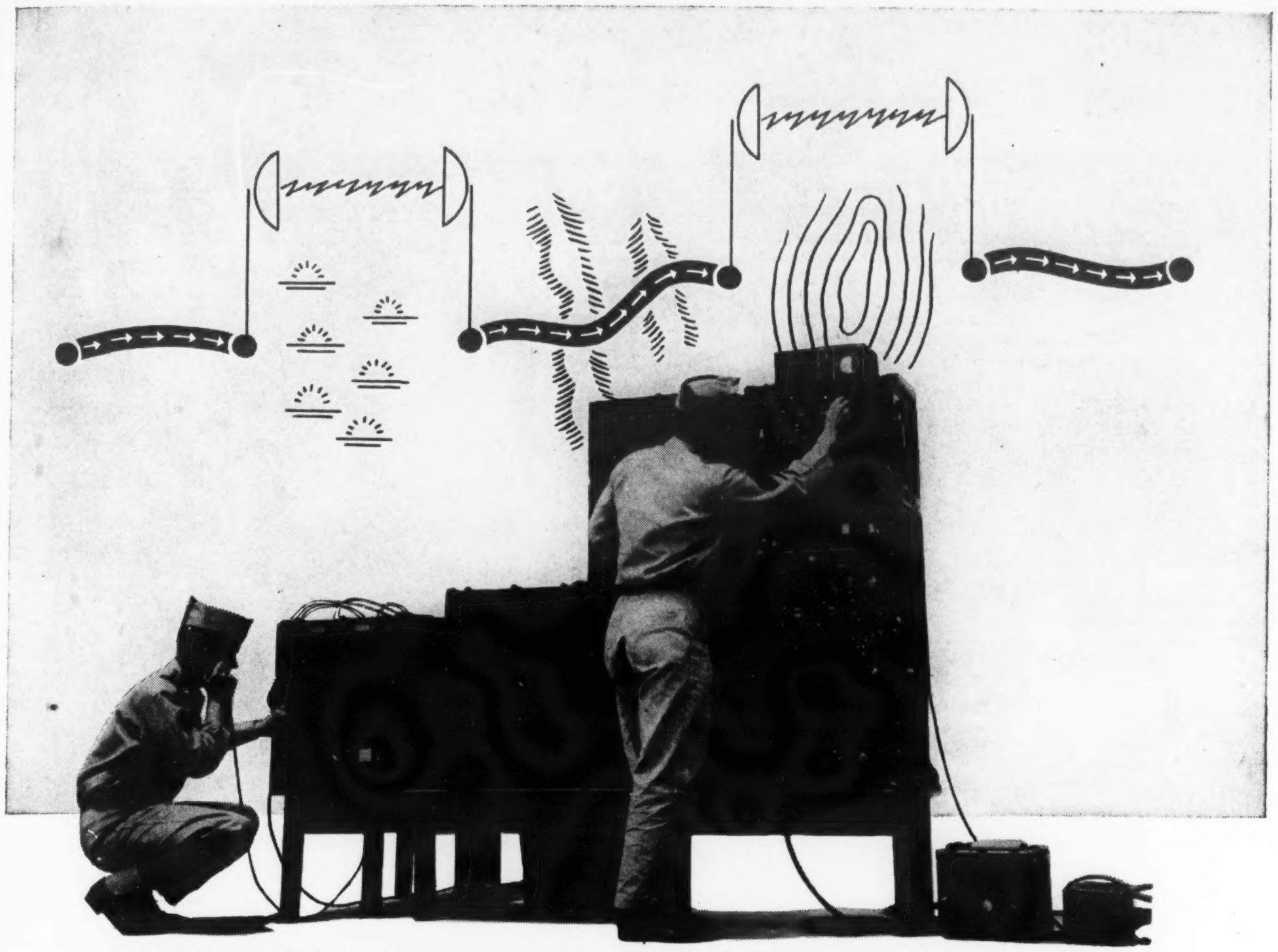


Dimensions:
(6173) 1-1/16 x 1⅜ x 3".
(6174A) 1 x 1¼ x 2¼".

For full data on stock UTC transformers, reactors, filters, and high Q coils, write for Catalog A.

UNITED TRANSFORMER C

150 Varick Street, New York 13, N. Y. EXPORT DIVISION: 13 E. 40th St., New York 16, N. Y. CABLES: "ARL



NO OBSTACLE TOO GREAT. Signal Corps men tune in a new military communications system combining land lines and radio. Map shows how radio is used to jump across a swamp and a deep ravine, both difficult to cross quickly by land line.

A Leapfrog Telephone System for the Armed Forces

The Bell System now is producing for the military a telephone system that will go anywhere communications are needed. When water or rough terrain prevents the stringing of wire, it takes to the air. Thus vital contact for our Armed Forces—no matter where they may be located—is assured.

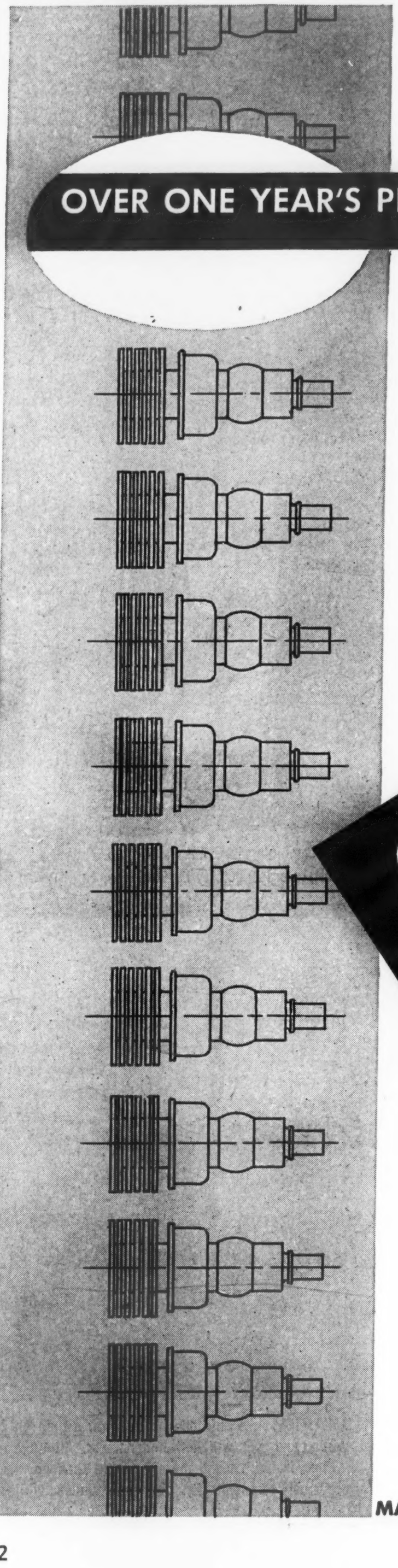
When Signal Corps linemen encounter geographical obstacles, they now can easily erect a portable antenna. This connects land lines by radio links, which leapfrog the trouble area.

This rugged communications system was developed for the U. S. Signal Corps by the Bell Telephone Laboratories. It has a 1000-mile range and can carry as many as 12 voices at once.

Uninterrupted flow of information is an important tactical weapon for today's Armed Forces. The Bell System works closely with the nation's military forces in developing and providing the most complete and modern communications in the world.

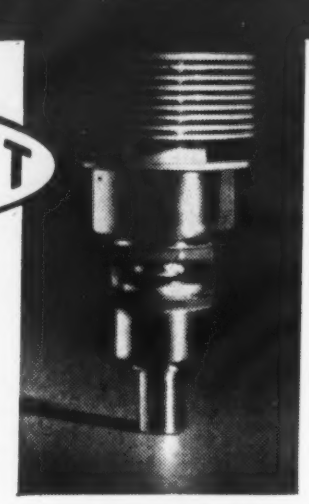
BELL TELEPHONE SYSTEM

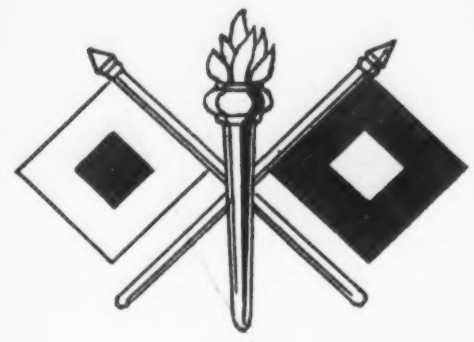
AMPLIFIERS like this can be used on a pole or the ground and even will work under water. Although the system is lighter and more portable than any used previously, transmission quality is unusually good.



OVER ONE YEAR'S PRODUCTION UNDER RIQAP – ML-2C39A

MACHLETT





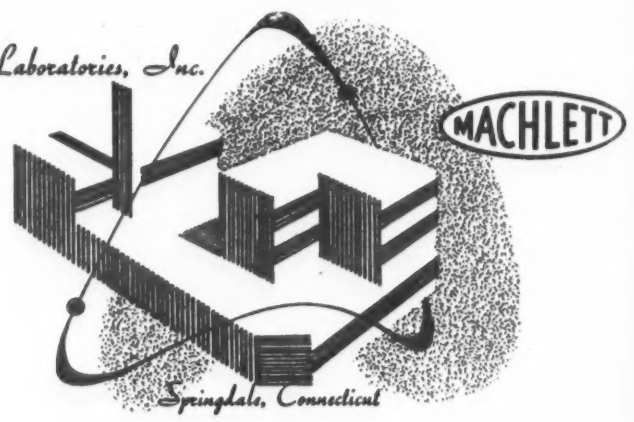
UNITED STATES ARMY SIGNAL CORPS

Only a limited number of manufacturers have qualified so far under RIQAP—the United States Army Signal Corps' Reduced Inspection Quality Assurance Program. Of these, Machlett Laboratories, Inc., was the first manufacturer of transmitting tubes to be approved for operation under the plan.

Machlett has now completed well over a year's successful production under RIQAP—a year of convincing evidence that this plan is ideally designed to achieve the mutual objective of users and producers alike for better quality, more reliable, electronic products.

All electron tubes of Machlett manufacture, regardless of type, are produced to the same rigorous, diligently maintained, high quality standards necessary to achieve "Approval Under RIQAP" recognition.

Machlett Laboratories, Inc.



MACHLETT LABORATORIES, INCORPORATED—Springdale, Connecticut

1624 Eye Street, NW
Washington 6, D. C.
Phone: EXecutive 3-3033

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SIGNAL

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Journal of the Armed Forces Communications and Electronics Association

VOLUME 9 | MAY-JUNE 1955 | NUMBER 5

9th Annual AFCEA Convention Issue

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Authors are entirely responsible for opinions expressed in articles appearing in AFCEA publications, and these opinions are not to be construed as official or reflecting the views of the Armed Forces Communications and Electronics Association.

"Peiping

an arrogant, contemptuous regime of hardcore international Communists..."

"I am often asked why the U. S. Government is firmly opposed to recognition of the Chinese Communists and giving them a seat in the United Nations. We are confronted in Peiping with an arrogant, contemptuous regime of hardcore international Communists who have played a gangster role in their relations with us and other countries . . . they have thrown our citizens into jail without trial, they have tortured and brain washed our prisoners of war, they have blackmailed our businessmen, they have confiscated our properties. They respect no law — divine, international or domestic, unless it suits their purposes to do so. They speak not for the great Chinese people and nation but for international Communism."

WALTER S. ROBERTSON
Assistant Secretary of State

To recognize Red China would be to condone the very evils we abhor. It would mean abandoning all moral principles, and destroying the hopes of oppressed peoples everywhere. We must not put the seal of approval on tyranny.

President

DUTY HONOR COUNTRY — LABOR BUSINESS GOVERNMENT

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1940

New York to Fairbanks, Alaska
1941

Rome to New York
1944

Kunming to Washington via Los Angeles
1945

pioneers in equipment for global communications

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low-cost "work horse"

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Dimensions

Overall length, 4"—Width, single pile-up 1¼"—double pile-up 1 7/16"—Height (depending upon the number of springs), Series AQA and ASO 1⅝"; Series ASR and ASA 1⅝"-2".

Four different types

Of Class "A" Relays are available to meet your needs: Series AQA—Quick-Acting, DC; Series ASO—Slow-Operating, DC; Series ASR—Slow-Releasing, DC; and Series ASA—Slow-Acting, DC.

Contacts

Normally single, but can be supplied with twin contacts. Load carrying capacity, 150 watts (maximum 3 amps., non-inductive).

Contact spring capacity

Can be supplied with single or double pile-ups. Series AQA and ASO, 13 springs per pile-up; Series ASR and ASA, 6 springs per pile-up. (More contacts can be accommodated at a sacrifice of operating speed and release time delay.)

Automatic Electric Class "A" Relays are still "healthy" even after 100,000,000 operations!

Here's a relay built for hard work, and every critical point shows it!

Contact points are formed and life-welded to the spring in one operation. An exclusive armature backstop design prevents armature freezing. A heavy-duty armature bearing is available for unusually heavy spring loads, or constant high-speed use.

Optional "long" or "short" lever armatures offer one lever-ratio for normal operating speeds . . . another for slow-to-release action, permitting a residual gap which holds the required release timing, even under heavy-duty conditions. When extreme conditions suggest added precaution, an armature damper spring may also be supplied to eliminate wear from induced vibration.

For complete details, write for Circular 1800. Automatic Electric Sales Corporation, 1033 West Van Buren Street, Chicago 7, Illinois. In Canada: Automatic Electric Sales (Canada) Ltd., Toronto. *Offices in principal cities.*

RELAYS SWITCHES

PRODUCTS OF THE INDUSTRIAL DEPARTMENT OF

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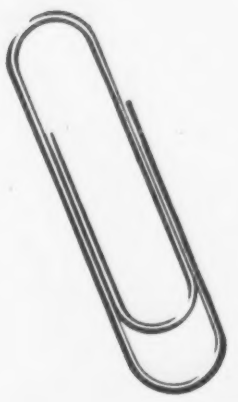
NO BIGGER THAN A . . .



YET IT DOUBLED THE EFFECTIVE POWER . . .

Complete surveillance is an important requirement of the modern army. To direct his forces, a military commander must have electronic eyes, ears and brains. Electronic data is provided by powerful radar systems used by the Army and built by General Electric. These radar systems utilize a small General Electric tube — the GL-6299 High Frequency Triode — which increases the radar range and reliability.

It is this extra touch of engineering genius that makes General Electric electronic equipment the finest and most effective built — ANYWHERE.

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Progress Is Our Most Important Product

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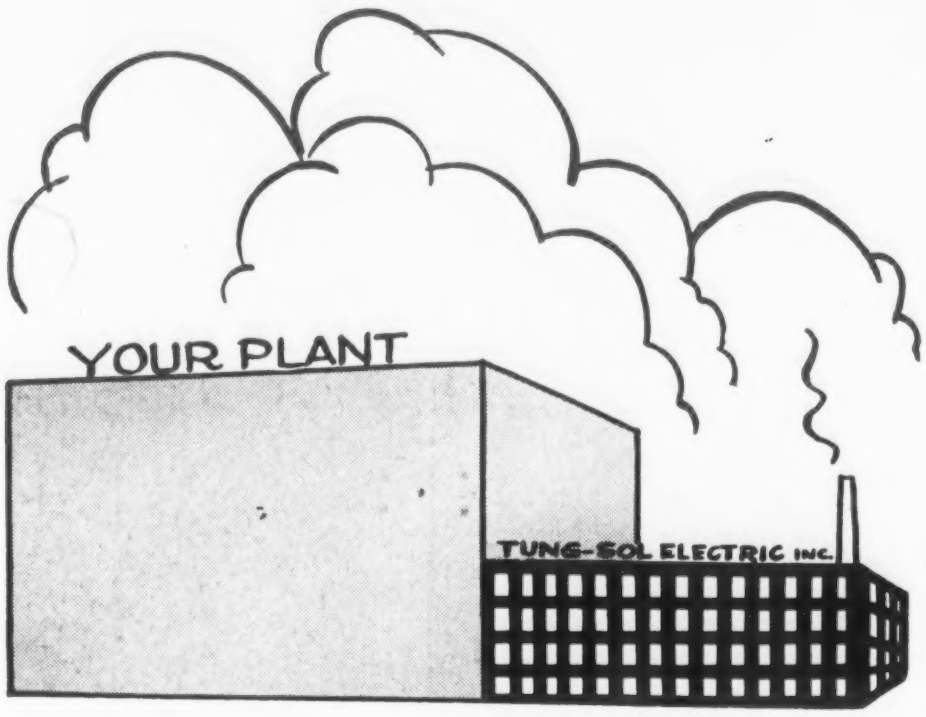

Our plant becomes an extension of your plant

Our engineering and manufacturing facilities can make our plant a vital extension of your plant. We make nothing but electron tubes—no sets—no equipment. We are completely independent, so we are in a position to keep your plans in strict confidence—to work with you with as much loyalty and secrecy as if we were in your own organization.

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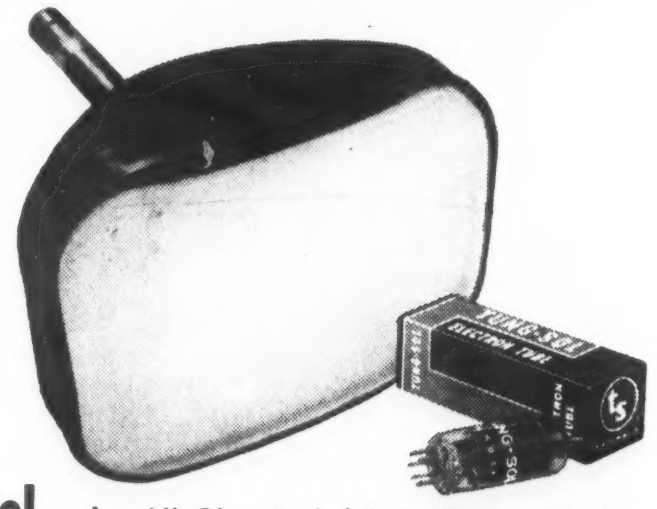
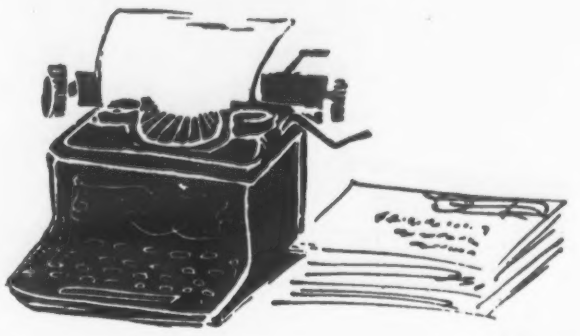


Tung-Sol makes All-Glass Sealed Beam Lamps, Miniature Lamps, Signal Flashers, Picture Tubes, Radio, TV and Special Purpose Electron Tubes and Semiconductor Products.



Our Readers Write

Oversight Seen in Manhattan

You've done it again! Printed a beautiful cover (March-April issue) without letting us know who is the photographer.

J. C. CRAIG
New York, N. Y.

(Ed. We certainly regret the omission, but it gives us a chance to thank, publicly, *Consolidated Edison Company of New York, Inc.* for allowing us to use their beautiful night-time shot of the midtown New York skyline, taken from across the East River.)

Correction Sustained

DEAR SIR:

I look forward with great pleasure to reading each issue of SIGNAL, and especially enjoy the Chapter News and catching up on the doings of many Signal Corps friends and associates.

Just this once, though, I feel that I "must" correct a statement in the March-April issue concerning Lt. Col. Buser's being the only qualified paratrooper of field grade rank in the Signal Corps. My husband, Col. Jules E. Gonseth, Jr., is a qualified parachutist having completed the course at Ft. Benning 22 April, 1947 while in the grade of Lt. Col. He served as Signal Officer of the 11th Airborne Division in Japan. And not only is he a parachutist, but also is a rated Army Aviation pilot with fixed wing, rotary wing, twin-engine and instrument ratings. At present, he is Assistant Commandant of the Army Aviation School at Camp Rucker, Alabama. All along the way of his career he has fought constantly for the Signal Corps to build up its prestige and to win back for the Corps a good Army Aviation program.

Besides my husband, I can also mention the following Signal Corps officers of field grade rank that are qualified parachutists: Lt. Col. Fred Hemmerich, Major Fred Hays, Lt. Col. Leo Merle, Lt. Col. Myron Smith, to mention a few.

Thanks for a grand column, and continued success.

MRS. JULES E. GONSETH, JR.
Hdqtrs. Army Aviation School
Camp Rucker, Alabama

Companies Accepted for AFCEA Group Membership Since March 1, 1955

Control Engineering Corporation
Norwood, Massachusetts

Electro Tec Corporation
South Hackensack, New Jersey

Packard-Bell Company
Los Angeles, California

Transistor Products, Inc.
Waltham, Massachusetts

(Brief notes about these companies appear on page 60.)

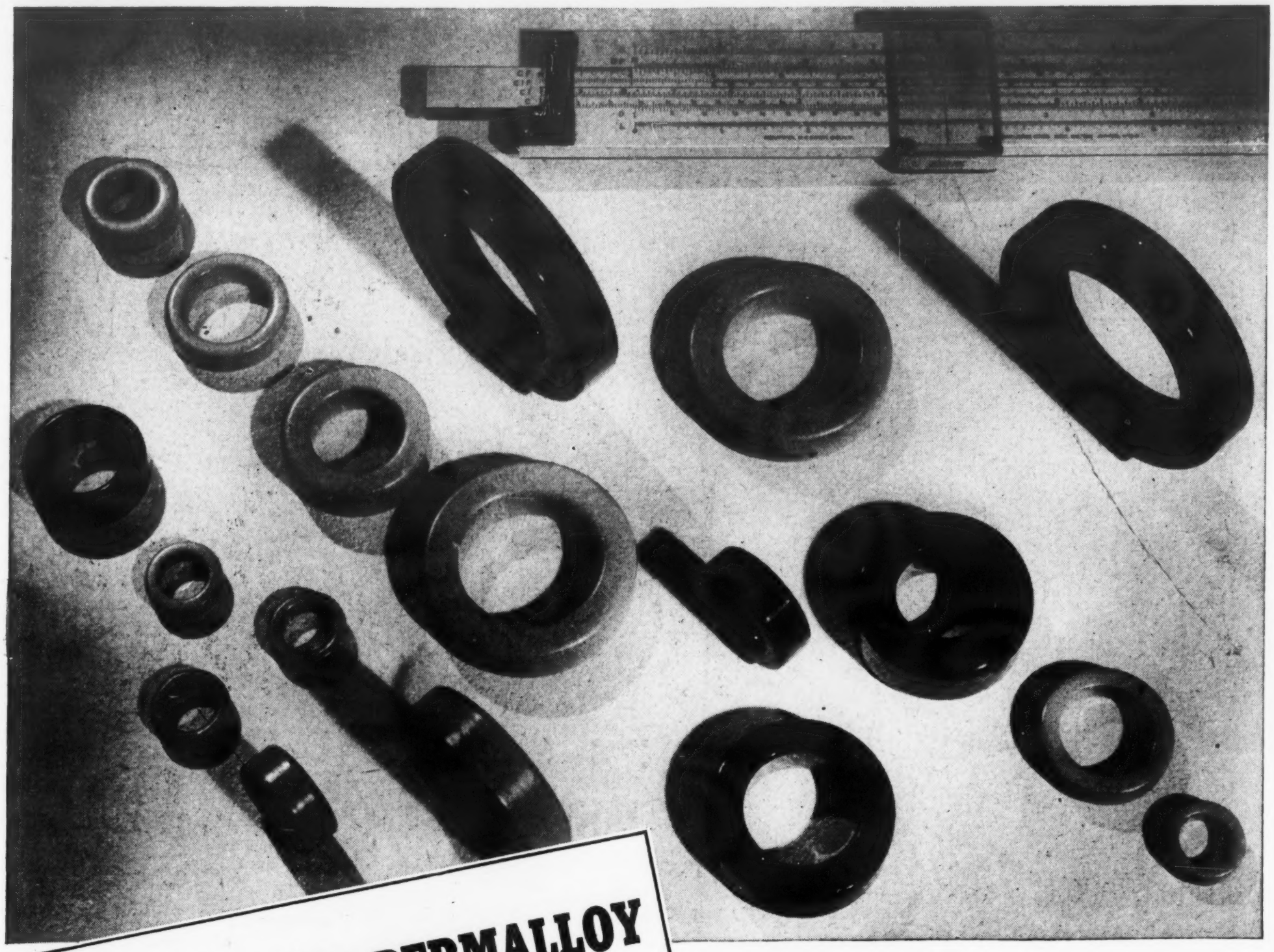
584 new AFCEA individual members from March 1 to May 1

V. I. P.

VERY IMPORTANT PRIVATE

Not rank, but *function,* determines a soldier's importance. This man is carrying, not just a Walkie-Talkie, but perhaps the fate of an army or a cause. Through him headquarters and other units keep informed; through him pass the orders that unite the efforts of many men into one resistless force. By creating, developing and producing a wide range of electronic equipment for all the armed services, RCA scientists and engineers are helping to provide every soldier, sailor, airman and marine with everything that modern electronics can contribute to military effectiveness, safety and comfort. Because the fighter of today must be trained to understand and operate this equipment, his status is higher than ever before and his opportunities correspondingly better.

GOVERNMENT DEPARTMENT
RADIO CORPORATION of AMERICA
ENGINEERING PRODUCTS DIVISION CAMDEN, N.J.



MOLYBDENUM PERMALLOY POWDER CORES*

(New technical data now available)

Write for Bulletin PC-104A, dated March 15, 1955

HIGH Q TOROIDS for use in Loading Coils, Filters, Broadband Carrier Systems and Networks— for frequencies up to 200 K C

For high Q in a small volume, characterized by low eddy current and hysteresis losses, ARNOLD Moly Permalloy Powder Toroidal Cores are commercially available to meet high standards of physical and electrical requirements. They provide constant permeability over a wide range of flux density. The 125 Mu cores are recommended for use up to 15 kc, 60 Mu at 10 to 50 kc, 26 Mu at 30 to 75 kc, and 14 Mu at 50 to 200 kc. Many of these cores may be furnished stabilized to provide constant permeability ($\pm 0.1\%$) over a specific temperature range.

COMPLETE LINE OF CORES TO MEET YOUR NEEDS

- ★ **Furnished in four standard permeabilities—125, 60, 26 and 14.**
- ★ **Available in a wide range of sizes to obtain nominal inductances as high as 281 mh/1000 turns.**
- ★ **These toroidal cores are given various types of enamel and varnish finishes, some of which permit winding with heavy Formex insulated wire without supplementary insulation over the core.**

*Manufactured under license arrangements with Western Electric Company

W&D 4744

THE ARNOLD ENGINEERING COMPANY

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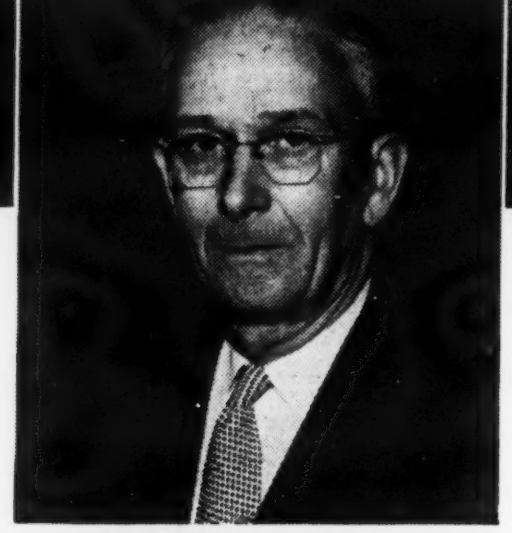
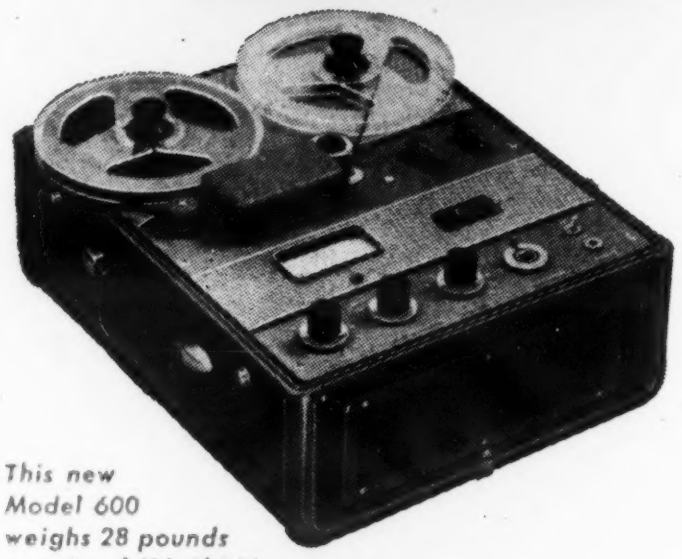


"18,000 HOURS and still within specs"

says Francis Brott, Chief Engineer, KOMO, Seattle

"Our first Ampex recorder showed us what a real professional machine can do. After 18,000 hours of heavy use, the frequency response and audio characteristics of our Model 300 head are still within the original published specifications. This kind of performance sold us completely on Ampex — that's why we've added four Ampex 350's."



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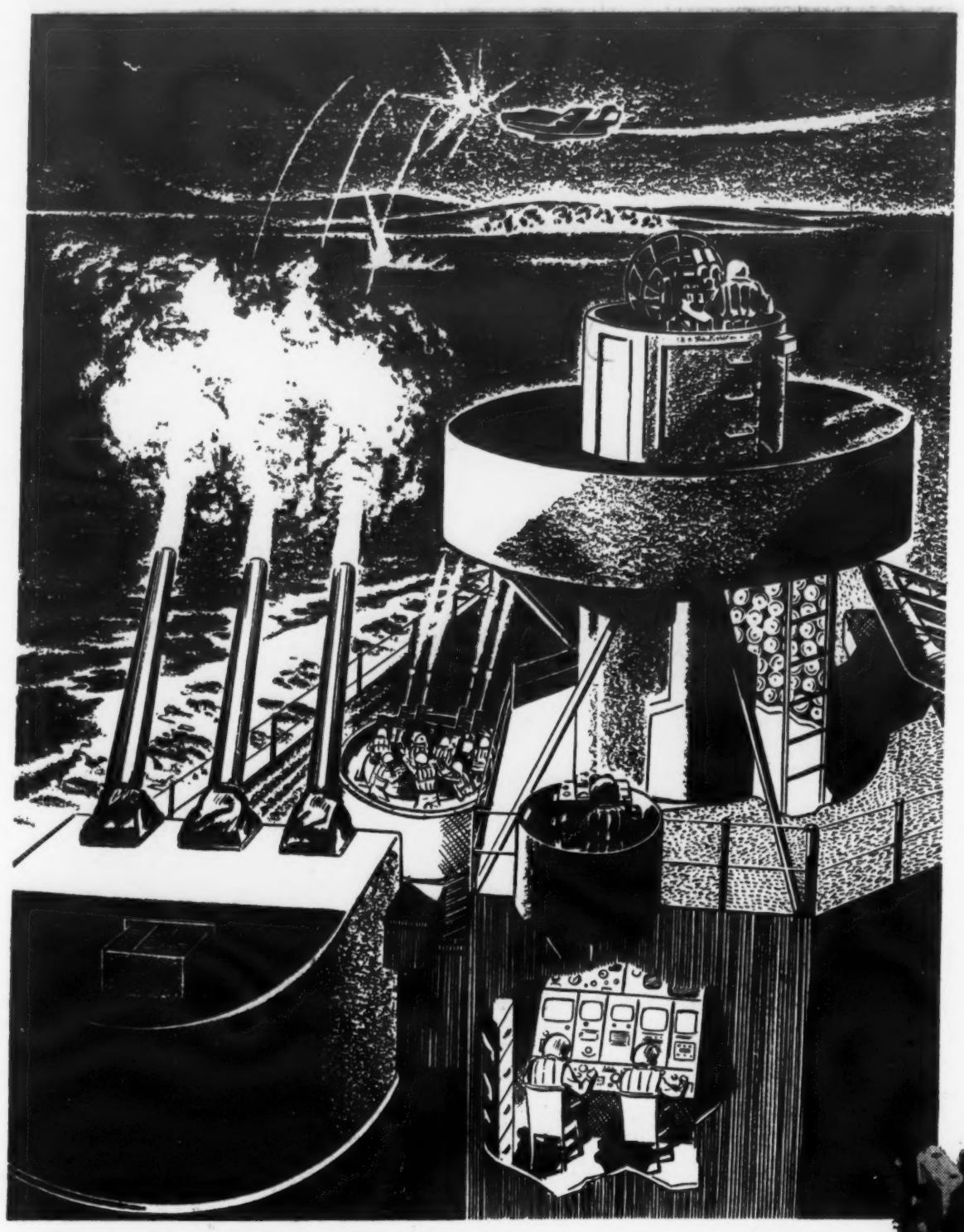

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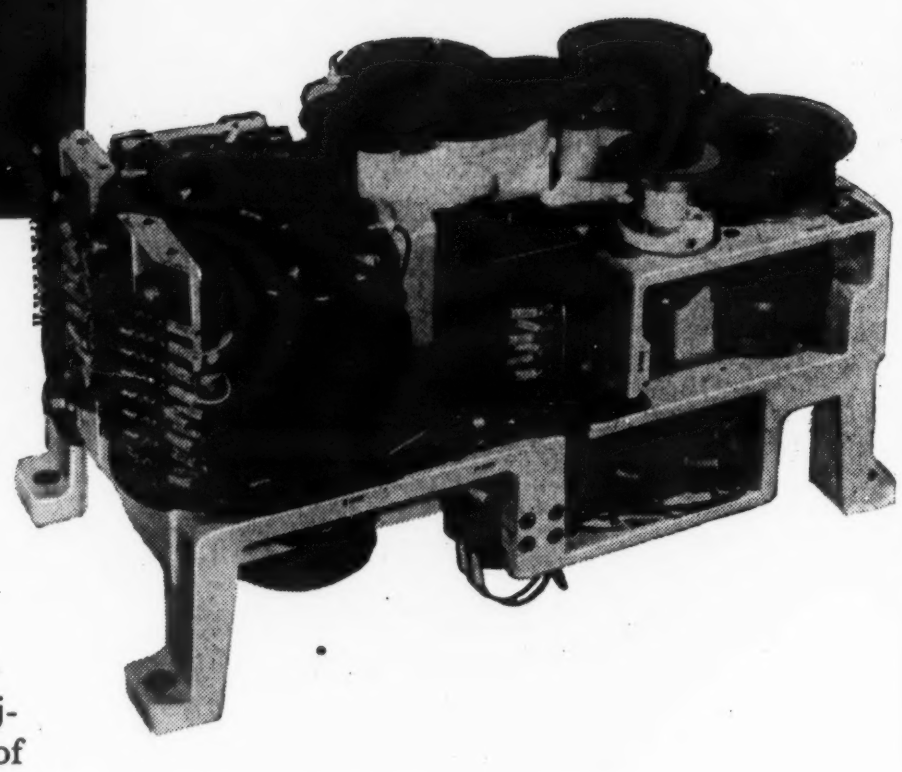

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TRUTH — the purpos

by Abbott Washburn

Deputy Director
United States Information Agency

IN STATING THE PURPOSE OF THE U. S. Information Agency, President Eisenhower, upon one occasion, said this:

> "It is not enough for us (the United States) to have sound policies, dedicated to goals of universal peace, freedom and progress. These policies must be made known to and understood by all peoples throughout the world. That is the responsibility of the United States Information Agency."

"All peoples throughout the world" covers a lot of territory. Reaching these people to make United States policies known and understood is a large order. But it is not impossible. *Utilizing modern techniques of communication, the job can be done.*

Conversely, of course, the advances in communication techniques make it possible for others to reach this vast audience. The Communists saw this very early. Ever since the Communist Manifesto was written in 1848, propaganda has played an important part in Communist activities. The Moscow-directed propaganda campaign, which now covers the world, was launched some 30-odd years ago and, it must be admitted, it has been effective. Today, Communists control some 11 million square miles of the earth's surface and over 800 million of the earth's people, and only a fraction fell to them through direct military action. Propaganda either did the trick alone, or propaganda weakened the intended victims for the final decisive blow.

It is impossible to measure the total volume of Communist world propaganda. During 1953, Communist nations are estimated to have spent over $3 billion on propaganda, domestic and foreign, and this is probably a conservative figure. In that year the Chinese Communist Government spent $1.4 billion for such activities. The USSR spent $1.2 billion. The Eastern European satellites added $700 million.

"Bob y Maria," an English-language broadcast of USIA-Madrid, has been an outstanding success. "Bob," Mr. H. M. Hull of United States Information Service, Madrid, portrays an American newspaperman who shows his bride, "Maria," Spanish radio actress Maria Carmen Goni, the United States. This is one of the many programs that have been found effective in acquainting free nations with life in the United States.

These figures, of course, do not include the sums spent by Communist parties outside the "Curtains" and the front organizations. All however, are active, and none, apparently, suffers for lack of funds.

Organized Propaganda

The parties and fronts provide an army of volunteer propagandists, but the Communists do not entrust their propaganda solely to amateurs. Many of their workers have been graduated from one of the 177 schools in the USSR giving postgraduate propaganda courses. Ho Chi Minh, Chou En-lai, Nam Ill of North Korea, are among those so trained. Many leaders of the Western Communist parties are graduates of this system.

In devising propaganda strategy

...os for global communications

No matter what equipment or processes are evolved with modern invention and design, all communications have the same powerful purpose — the exchange, dissemination and preservation of TRUTH — mighty weapon of the free world.

the Communists anticipated the Hitler technique of the Big Lie and consistently have based their campaigns on distortions, exaggerations, misrepresentations and ungarnished lies. It is front page news when the Communists tell an unpleasant truth about anything. They employ, of course, all modern communication techniques: the radio, the press, publications of all kinds, motion pictures. Their agents are busily making word-of-mouth propaganda all over the world. Each has a specific assignment.

Communism's propaganda is designed to implement its policy: to achieve the establishment of a world Communist order. The immediate aims of Red propaganda are to divide the nations of the free world and particularly to isolate the United States; to soften up areas which seem vulnerable to Communist conquest; and, where conversion to Communism now seems impractical to foster anti-Americanism and neutralism.

The United States, the most powerful and determined of the anti-Communist nations, is the particular target of Communist hate-propaganda. A stream of vituperation against the United States pours out over the world from Moscow, from Peiping, from the satellites, on a 24-hours a day, 365 days a year schedule.

It is against this vicious and well-heeled foe that the U. S. Information Agency is fighting. It should be understood, however, that the Communists today only lend urgency to our efforts. They are not the sole reason for the U. S. Information Agency. The Assistant Secretary of State, George Allen, Former United States Ambassador to India, has called the Agency's activities "a new kind of diplomacy." In the past, he points out, diplomats dealt only with officials of other nations. Today, they must deal also with the peoples of those nations.

Foreign Opinion Vital

The democracies, generally, were slow to recognize this need. The United States can take consolation in the fact that it was not the only democracy slow to recognize this need. A 1954 report of a British committee appointed to study British overseas information programs has a decidedly familiar sound:

"These conclusions (reasons for a British overseas information program) have been forced upon us by sheer weight of evidence. At first we were inclined to be skeptical . . . we could not but feel suspicious . . . nevertheless, we have found it impossible to avoid the conclusion that a modern government *has* to concern itself with public opinion abroad and be properly equipped to deal with it."

The same thought is expressed in report after report of the various committees and commissions which have studied United States international information activities. And, unfortunately, the attitudes reported are still reflected in the thinking of too many Americans.

President Eisenhower, however, is not one of these. His deep conviction about the need for a national overseas information program found expression on the day after his inauguration. On that day he appointed a Committee on International Information Activities (the Jackson Committee). At about the same time, the Senate appointed a special Subcommittee on Overseas Information Programs (the Hickenlooper Committee).

Acting on recommendations of these committees, the President established, August 1, 1953, the new U. S. Information Agency, giving it independent status and full responsibility for all United States non-military overseas information programs, including those which had been previously under the Department of State and the Mutual Security Agency.

The U. S. Information Agency today is almost twenty months old. It is not always easy to judge the effectiveness of programs such as that of the U. S. Information Agency, but from the increasing venom of Communist attacks on the Agency and even on its personnel (identified by name), it can be assumed that the

Mr. Washburn was appointed Deputy Director of the USIA in November, 1953, after having served as Special Assistant to the Director of the Agency. A graduate of Harvard University, Mr. Washburn was associated with General Mills Inc. for 13 years, and served as Executive Vice Chairman of the Crusade for Freedom.

programs are, at least, making an impression. In the past few months, it has been noted also that the Communist propaganda campaign, reacting to the U. S. Information Agency programs, has been definitely sharpened and accelerated.

The U. S. Information Agency today operates chiefly as an overseas program. To the fullest extent possible, responsibility for all operations has been shifted to the field. Headquarters staff in Washington has been reduced to approximately 2,000 and acts as a policy making and service organization only.

The Washington headquarters staff includes four assistant directors in charge of geographical areas: Europe, the American Republics, the Far East, and the Near East, South Asia and Africa. These area directors spend most of their time in the field, keeping constant and personal contact between headquarters and the overseas posts.

The various communication services operate under four divisions: the International Broadcasting Service, the International Press and Publication Service, the Motion Picture Service, and the Information Center Service. There is, in addition, an Office of Private Cooperation, responsible for enlisting in the program the active interest of private American citizens and groups.

The International Broadcasting Service or the "Voice of America" is, perhaps, the best known of the U. S. Information Agency operations. It is, in fact, so well known that many Americans seem unaware that the U. S. Information Agency is more than the "Voice." Actually of the Agency's last appropriation, $77 million, the "Voice" received only about $16 million.

"Voice" Beams Freedom

The "Voice" is, however, an important operation. For the peoples behind the "Curtains" it is the Agency's principal channel of communication. For this reason, three-fourths of its broadcasts are beamed to the Communist orbit.

During the past year, the "Voice," under a Congressional directive, moved its studios to Washington and is now housed in the Department of Health, Education and Welfare Building, at the foot of Capitol Hill. The transfer was completed in November, without interruption of the broadcasting schedule.

To radio men, the "Voice's" new quarters are fascinating. There are 14 studios, with more than 75 programs being transmitted daily. All are necessary for a successful operation. In addition, there are 10 recording rooms with equipment to make 40 discs or tapes simultaneously, 10 tape-editing booths, a recording center and the master control room. The rest of the space (100,000 square feet in all) is devoted to editorial offices, music transcription libraries and other offices required to keep the "Voice" in operation around-the-clock.

Theodore C. Streibert, Director of USIA, and Sir John Kotelawala, Prime Minister of Ceylon, record a broadcast in English for transmission via Voice of America facilities.

The Master Control feeds the programs via telephone lines to 30 short-wave transmitters in the United States. Including these 30, the "Voice" has a world-wide network of 78 transmitters. Government-owned relay stations overseas are located at Salonika, Tangier, Ceylon, Honolulu, Munich, the Philippines and Okinawa. The latter three have million-watt transmitters.

The "Voice" also operates a mobile and flexible relay station on the U. S. Coast Guard Cutter "Courier," now stationed in the Mediterranean. Other relay facilities overseas are leased from the British Broadcasting Corporation in England and local broadcasters elsewhere in the world.

The "Voice's" daily programs—in as many as 38 languages—include 30½ hours of direct broadcasting and 64 hours of repeat programs from the relay bases. The schedule includes 6½ hours of daily broadcasts to the USSR and Soviet-controlled areas. To counter jamming, programs are repeated on short, medium and long wave. Transcribed programs are air-shipped to the relay stations and to the U. S. Information Agency offices overseas for placement on local stations.

The programs get through. That they are heard and are effective is almost daily reflected by the Communists' bitter attacks on the "Voice" generally and on certain programs in particular. Escapees and defectors all report having heard the programs and testify to their influence. Josef Swiatlo, former head of the Communist secret service in Poland, declares

(*Continued on page* 58, *col.* 1)

Bookmobiles, travelling exhibits and motion pictures extend the influence of the USIA information centers. Miss Myrtle Thorne, Public Affairs officer in Medan, Sumatra, takes her mobile unit to remote villages of the 180,000 square-mile island. The unit is equipped with a generator, motion picture equipment, and a library.

A WV-2 early warning aircraft rendezvous, via air/sea communication, with an attack carrier. Loaded with tons of radar, the "eyes of the fleet" will prowl the skies far in advance of surface forces and make first contact with an enemy fleet by use of its far-reaching radar beams.

Communications—the Voice of Naval Command

by Commander A. E. Baughman, USN

NAVAL COMMUNICATIONS PERMITS NAVAL COMMANDS TO communicate with one another over distances ranging from a few yards to thousands of miles. Naval Communications embraces all known means of communications from mail to the most highly complex electronic devices. Its primary function is to furnish reliable, secure, and rapid communication service for the use and control of the Naval Operating Forces—It is The Voice of Naval Command.

In peacetime, within economical limitations, as complete a state of communication readiness as possible is maintained in an endeavor to meet initial wartime requirements. The degree of readiness of Naval Communications for war is determined by its ability to expand and adapt the major elements of a world wide communication system into any possible strategic areas. The transition from peace to war must be accomplished with the least possible effort and in the shortest possible time.

The successful conduct of modern warfare is possible only when communications function to carry the orders to operating units and keep the Force Commanders informed of the progress and effectiveness of operations. An operation by a fleet commander today can be expected to employ numerous ships, aircraft, and possibly troop units, dispersed over wide areas and prepared to engage in combat with an actual or potential enemy. These forces must be organized so that they can be controlled and directed quickly. Rapid tactical communications must be provided so that this direction and control is instantaneous. Safeguards must be established to protect these tactical communications from enemy interference and interruption.

The demand for increased capacity to handle communications and for higher standards in reliability and speed is expected because of several factors involving improved military capabilities.

The advent of atomic weapons alone involves wide dispersion of forces and greater necessity for rapid dissemination of combat information. These factors place greater emphasis on reliable communications.

Modern warfare demands an extensive and complex communication system, requiring highly engineered installations for efficient operation. The availability of electronic material and radio frequency spectrum space, both vital factors, is critical. This results in a definite need for planning and direction at the highest command level.

The Director, Naval Communications is assigned the responsibility of providing and maintaining reliable and secure communications, based on war requirements, adequate to meet the needs of the Naval Establishment, primarily to serve command and secondarily to facilitate administration. To carry out his mission the Director, Naval Communications maintains and operates the Naval Communication System, utilizing commercial and other Government Communication facilities when necessary to insure effective service. The Naval Communication System consists of the essential shore facilities and services required to provide communications support for the Naval Operating Forces, the Navy Department, and the Naval Shore Establishment.

Use of Commercial Facilities Necessary

The organizational concept of the Naval Communication System provides that primary communication centers be located throughout the world to furnish complete radio coverage of the major portions of the world's strategic ocean areas. These centers maintain broadcast delivery of messages to all naval ships in the ocean area which each station serves; a high frequency ship-to-shore circuit; and radioteletypewriter and radiotelephone circuits for use by fleet or force commanders or for linking the primary centers.

Primary tape relay stations are established at each of the primary communications centers. The various naval districts tie into these primary relay stations either by landline or by radioteletypewriter trunk circuits. Each continental naval district has a major tape relay station and is connected to Washington or San Francisco by direct wire circuits. Eastern naval districts channel traffic to Washington; western districts to San Francisco. Major relay stations outside the continental limits feed into primary stations by radioteletypewriter. Minor and tributary stations are set up within each naval district when the volume of traffic justifies the arrangement.

Visual ship-to-ship communications are employed for inter-fleet operations when proximity of ships will allow. Below, saliors use the glass and blinker on the signal bridge.

The Navy utilizes commercial radio, television, cable, telephone and telegraph communications when naval communication facilities are not available or do not suffice in a particular situation. The Chief of Naval Operations makes appropriate arrangements to utilize the facilities of U. S. commercial communication companies, in order to supplement existing naval communication facilities during time of national emergency. Such utilization is subject to executive order by the President and is effected in accordance with allocations of facilities as required by the Joint Chiefs of Staff, approved by the Secretary of Defense, and allocated by the Office of Defense Mobilization.

Many communication problems in the Navy are basically the same as those of any large organization. However, because fleets, shore stations, and aircraft are involved there are certain distinctive features of naval communications.

Fleet communications have special problems with regard to equipment. Conditions of gun-fire shock, humidity, extremes of temperature and effect of salt air, all place severe demands on communication equipment afloat. At the same time, absence of units from permanent repair facilities make the factors of reliability and long life particularly important.

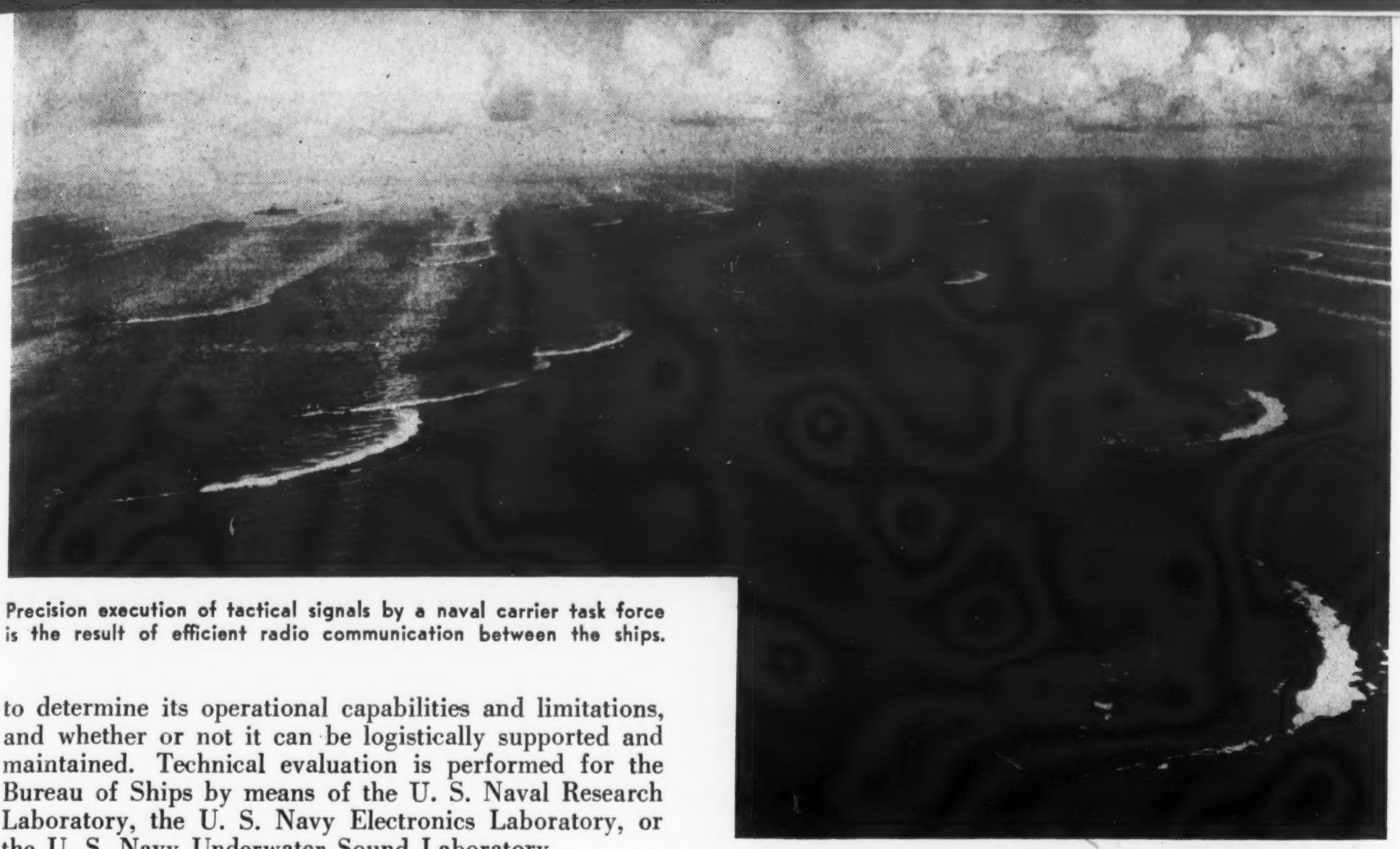
Because of the almost continuous use to which shipboard equipment is subjected, ease of maintenance is vital. Furthermore, this maintenance often must be handled by repairmen of only moderate skill. Standardization of parts and equipment has aided in the solution of this problem. This has also been beneficial in space and weight considerations, which are always important aboard ship. In addition to ease of maintenance, ease of operation is most desirable. The latter quality reduces the requirements of training of operating personnel and even permits use of equipment by non-communication personnel.

Unique Personnel Conditions

The personnel problems of fleet communications are distinctive in that only military personnel are involved. Another feature, which is generally true throughout the Navy but most prominent in the fleet, is that key communication officers are unrestricted line officers. It is a Navy policy for all line officers to have a good working knowledge of communications. Conversely, all communication officers (with a relatively few exceptions) must be qualified for general line duties.

Development of communication equipment used by the Navy is a result of information learned from study and research projects or from operational requirements as determined by review of fleet exercises and operations.

To accomplish progressive improvement in fleet communications, the Director, Naval Communications has an Engineering Branch that includes engineers and electronics officers who are familiar with ship and shore communication systems. They review technical reports from the civil and military research laboratories in order that new methods or techniques may be considered and adopted. These equipment and system engineers must meet future as well as current requirements. After equipment is developed, it must be evaluated to determine whether or not it is suitable for military use. If found technically suitable, it is given an operational evaluation



Precision execution of tactical signals by a naval carrier task force is the result of efficient radio communication between the ships.

to determine its operational capabilities and limitations, and whether or not it can be logistically supported and maintained. Technical evaluation is performed for the Bureau of Ships by means of the U. S. Naval Research Laboratory, the U. S. Navy Electronics Laboratory, or the U. S. Navy Underwater Sound Laboratory.

Operational requirements are based upon fleet doctrine, fleet tactics, and ship development. Since shore stations exist fundamentally to support the fleet, an operational requirement for shore communication equipment generally stems from a fleet requirement. These operational requirements are studied in the Office of the Chief of Naval Operations and from these studies are determined the allowance of equipment per ship and shore station required to meet these requirements. The Bureau of Ships proceeds to fill these allowances with equipment available. If the equipment is not available to meet the specified requirement, or cannot be economically modified, new equipment must be developed and procured.

The first step in the development of new equipment is to write a set of military characteristics. These characteristics are prepared in the Office of the Chief of Naval Operations and are studied for possible joint interest. An investigation is also made to determine if equipment already in existence or under development will fill the requirements.

After approval of the Joint Communications-Electronics Committee, the characteristics are forwarded to the Bureau of Ships. The Bureau of Ships, using the military characteristics as a guide, writes a set of technical specifications. A proposed "Research and Development Project" is forwarded to the Electronics Committee of the Research and Development Board for consideration to prevent undesirable duplication of effort. If no undesirable duplication is apparent, the project is approved.

The Bureau of Ships then submits the specifications to manufacturers for contract bids. After the contract has been awarded, the research and development stage follows, under the close supervision of Navy engineers. The acceptance tests follow the development, and finally the service evaluation tests are conducted aboard a ship or at a station before the equipment is approved and purchased. In the case of shipboard equipment, the service tests are performed under the direction of the Commander, Operational Development Force. He has available to him qualified technical personnel and various types of ships and aircraft for which the equipment is intended. The service evaluation tests consists of actually using the equipment under conditions which duplicate its ultimate employment, with naval personnel operating and maintaining it. This is done to make certain that it will fulfill the operational requirement, and meet the rigid physical standards imposed by the specifications.

Naval Communications ashore are characterized by continuous operations of a uniform nature. Large volumes of traffic are generally involved, but the availability of landlines reduces demands on radio. Communication equipment used ashore must be compatible with that used at sea or in the air. However, the requirements as to weight and space are not as severe. Reliability is an essential factor and long range capabilities are particularly important in the radio equipment.

Naval communications involving aircraft require special considerations. Aircraft must operate ashore or at sea, from civilian, military, or Allied bases. Radio is the almost exclusive means of communication to or from aircraft. The equipment used must be compatible with ship and shore radio equipment. Weight and space factors are of the utmost importance. Miniaturization is most profitable here. The nature of aircraft operations make ruggedness and simplicity of operation essential. The personnel considerations are similar to those of both ship and shore communications. Much of the radio operation is not done by communication specialists. This is predominantly true of single seat aircraft.

In order to insure that operating methods and procedures are common between the U. S. military services and prospective allied services, liaison is maintained with the Army, the Air Force, and with allied countries. This is accomplished mainly through the Joint Communications-Electronics Committee. Through this agency common operating instructions are produced and compatible equipment is accomplished whenever feasible.

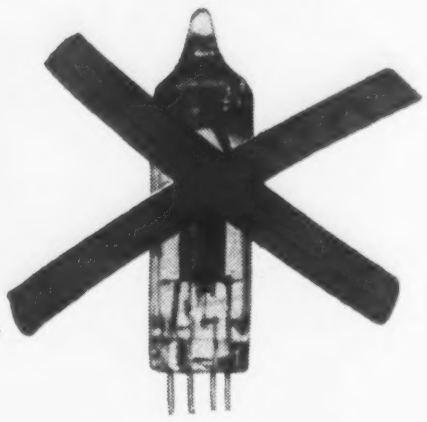
In summary, *Naval Communications is*, in effect, *the nerve system of the Navy*. Material, methods, and procedures are constantly being improved and standardized to effect economy insofar as consistent with operational requirements. "The voice of naval command" is under continuous survey and study in order that it will become more reliable, more secure, and more effective in serving the needs of the naval service.

Research and development at the Crosley Division of Avco are setting the pace in electronics advancement. Since transistor inception, Crosley has been pioneering in transistor circuit applications – bringing into focus new concepts in global communications.

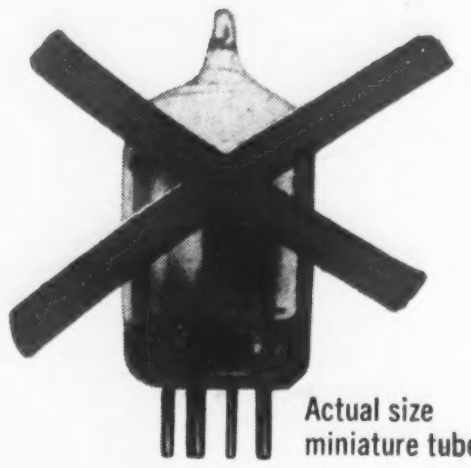
By coordinating transistorized circuitry with miniaturization and unitization techniques, Crosley is solving many of the problems inherent in present-day communications equipments. For greater dependability and longer life, transistors are replacing vacuum tubes. For easier portability and installation, weight and size are being minimized – replacing bulk with functional, streamlined design. Power demand is being reduced, and maintenance greatly simplified.

Yes, here's one more major development in Crosley's enthusiasm to build greater and greater reliability into smaller and smaller packages.

Actual size
transistor

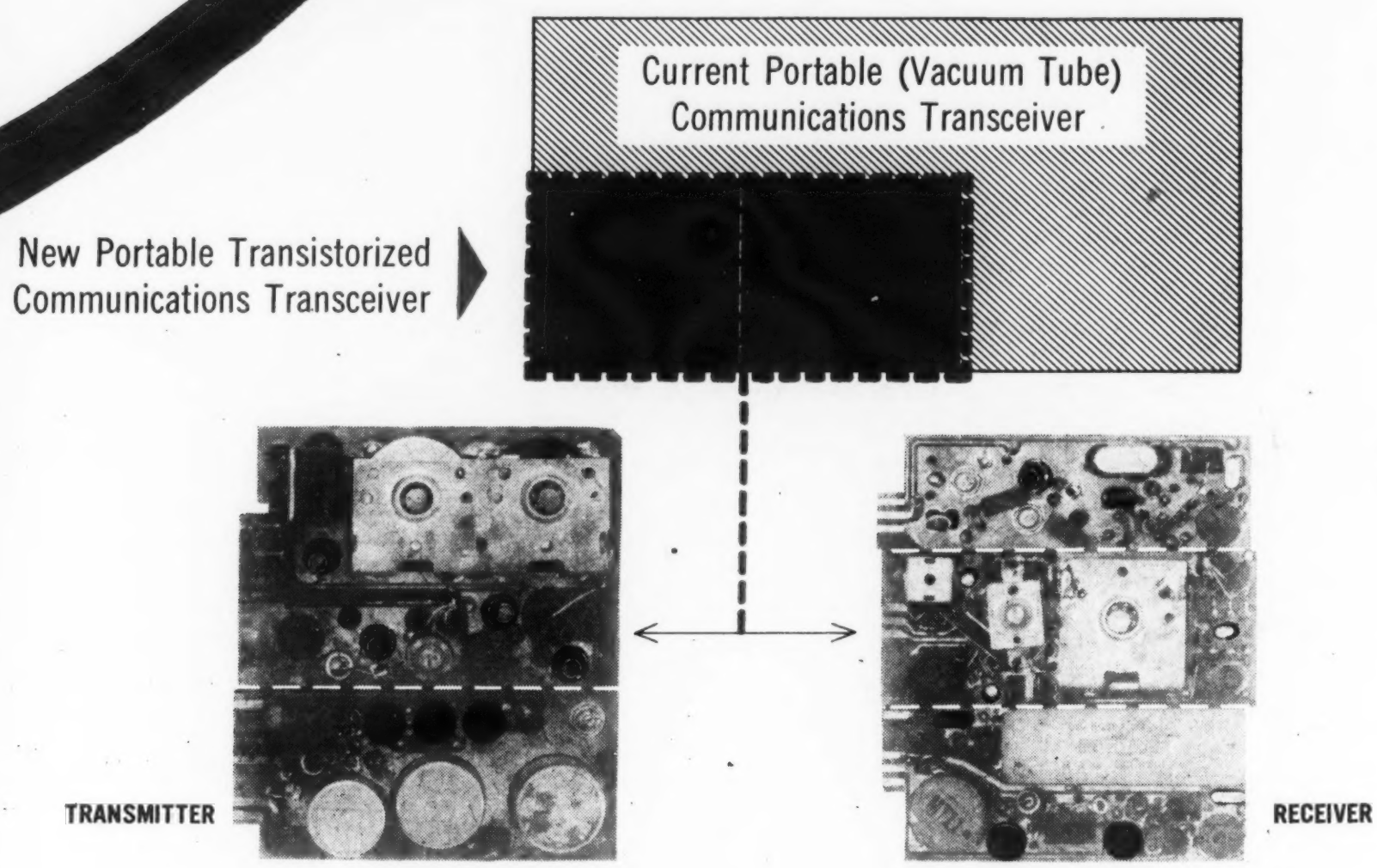


Actual size
sub-miniature tube



Actual size
miniature tube

READY FOR IMMEDIATE APPLICATION



The graphic comparison above clearly indicates Crosley's progress in minimizing weight and size through miniaturization. Next, the transistorized circuitry and unitized construction offer equal evidence that Crosley is providing improved electronic characteristics plus ease of manufacture and maintenance.

This transistorized equipment, developed under the direct sponsorship of the U.S. Army Signal Corps, has already sparked new circuit and package techniques applicable in other fields of electronics. And Crosley is continuing to expand the area of exploration into more advanced and diversified applications.

Our team of engineering specialists welcome opportunities to assist you with your specific requirements in these important fields. *Contact Avco Defense and Industrial Products, Cincinnati 15, Ohio.*

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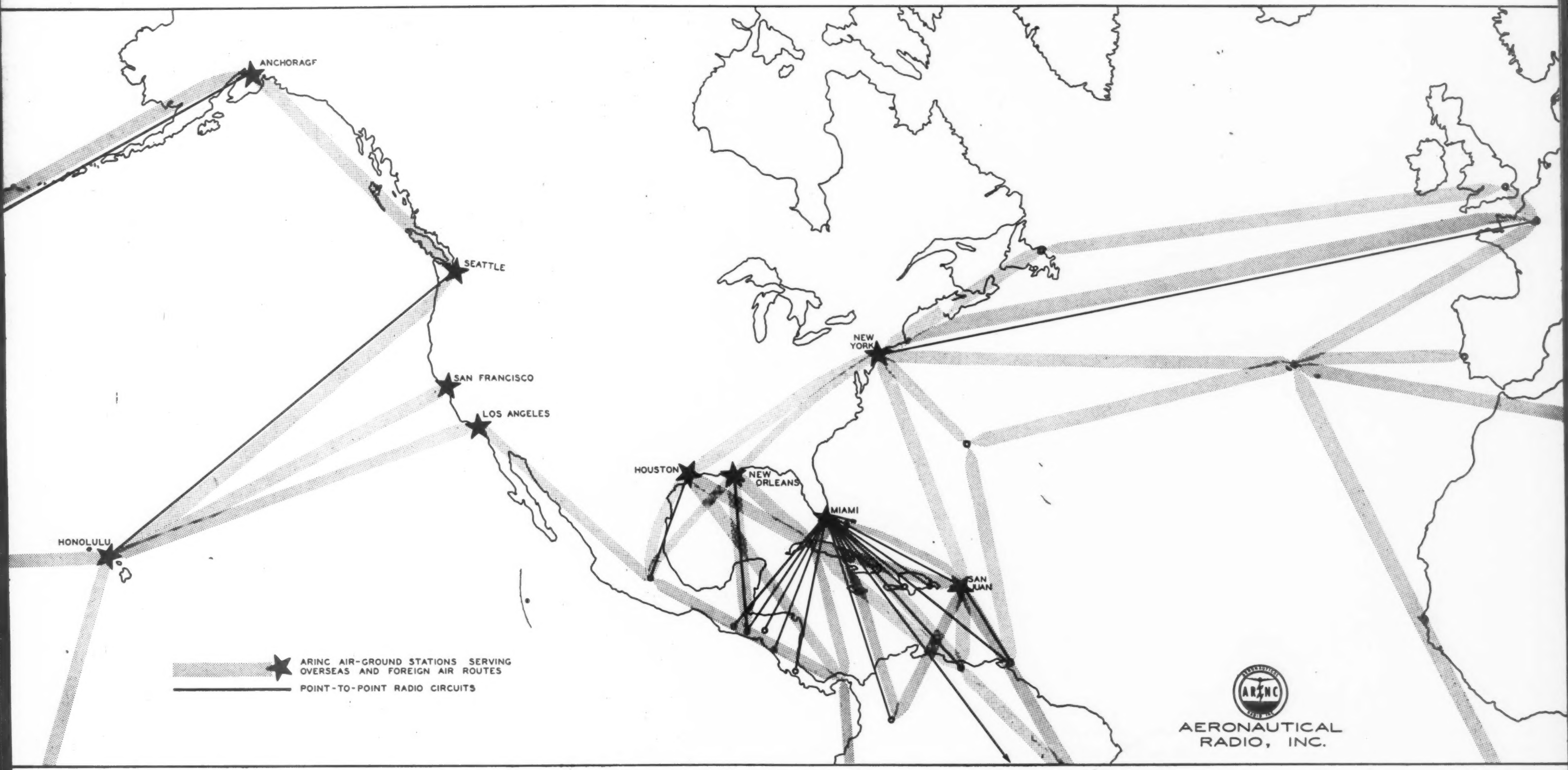


Chart of ARINC domestic and overseas installations serving American overseas and foreign air carriers.

International Services of Aeronautical Radio, Inc.

by Robert J. Gleason
Vice President
Aeronautical Radio, Inc.

AERONAUTICAL RADIO, INC.—perhaps better known as ARINC—is a company formed and owned substantially by the scheduled airlines of the United States. ARINC, for twenty-five years, has been the licensee of all domestic airline enroute radio communication stations, and, for the past seven years, has furnished service to international aircraft operations on overseas and foreign routes.

When pre-war international routes were being re-established and many new routes inaugurated, a number of the U. S. Flag carriers requested ARINC to provide common communication facilities to serve them at several points. Initial services to routes outside the continental limits began in the Caribbean area and the first ARINC international gateway stations were established at Houston and New Orleans in 1948. ARINC also engineered and supervised installation of similar stations at Havana and Mexico City. In 1949 a station was commissioned at San Juan, and in 1950-51 an even larger facility was built at Miami.

Concurrently, Pacific routes were developed, and ARINC constructed stations at Anchorage, Tokyo, and Okinawa to meet the civil airline requirements in the north and west Pacific.

With the inauguration of air-ground radio service, improved communication, with direct voice communication replacing the slow radiotelegraph air-ground-air service came to these extensive overseas air transport operations. Although radiotelephone was provided on many Caribbean and Central American routes as they went into operation, it had to be demonstrated that phone service would be satisfactory on the longer over-ocean routes.

Again the airlines of the United States pioneered, and tackled as the proving ground the longest scheduled airline hop being flown then or today —Seattle to Honolulu, 2900 statute miles—with no land available for intermediate stations! To serve that route, as well as the San Francisco and Los Angeles routes to Hawaii, well engineered stations with the best equipment available were constructed near Honolulu, Seattle, San Francisco and Los Angeles. Proving flights were conducted without difficulty in November, 1948, and these four stations working together as a network have, since 1949, provided this service to every U. S. airline flight between the Pacific Coast and Hawaii. The highest order of reliability is maintained on these very heavily traveled routes, even during ionospheric disturbances.

After overseas aircraft radio-telephone operation between the Coast and Hawaii was thoroughly proven, it was gradually expanded to all American international airline routes. The system grew from Hawaii to Manila, Tokyo and southward into the Pacific, around South America, and in 1951 into the Atlantic, with a station built by ARINC at New York as the U. S. key to the Atlantic network.

The ARINC stations providing ground-air service operate in each network on groups of frequencies suitable for round-the-clock use on the route. The routes between Hawaii and the Mainland are now served by two families of five frequencies each, with two other frequency families terminating in Hawaii for network operation into the western and southern Pacific. The North Pacific route via Alaska uses still another family; the North Atlantic presently has two groups, and the Caribbean four. Similar radiotelephone networks for world routes have been agreed upon by the members of the International Civil Aviation Organization and frequencies determined within the framework of the International Telecommunications Union Agreement.

A typical remote receiver installation.

Today, the U. S. airlines, almost without exception, *operate over all global routes using radiotelephone for enroute communications.*

ARINC also provides international aeronautical point-to-point service. The sixteen radio circuits terminating in the station at Miami are shown on the accompanying chart, along with other ARINC point-to-point services which include Seattle-Honolulu, Anchorage-Tokyo, and the New York terminal of a circuit to Paris. Not shown on the chart is the civil network connecting Okinawa with stations at Manila, Tokyo, Guam, Taipeh and Hong Kong.

A few circuits are still operated manually, but most are radioteletype, with some multiplexed and more being converted to multiplex. ARINC also leases cable and landline circuits to Cuba, Newfoundland and Alaska, as well as landline circuits within the U. S. between several of the stations.

Although all stations operate twenty-four hours a day, the remote transmitting and receiving sites are engineered for unattended operation. All control of transmitters and receivers, including changing frequencies on both ground-air and point-to-point channels, is by the operator at the control point. Engineers and technicians carry on a thorough preventive maintenance program but no regular watches are maintained at transmitter or receiver sites. The doors are locked most of the time! Auxiliary power plants with automatic cutover are provided at all remote sites. While there is an emergency transmitter and some tuneable receivers at each control point for air-ground emergency use, they have rarely been used.

All equipment is, of course, fixed-tuned, crystal controlled. All usable air-ground frequencies are guarded simultaneously and the calling frequency selected instantly by a unique system developed by ARINC engineers. To improve establishment of contact and lessen pilot problems, SELCAL (Selective Calling) equipment has recently been installed at all stations. Space diversity with rhombic antennas is used on many of the long-haul services. Receiver sites are carefully chosen and some are so isolated that they are provided with their own microwave links into the control points.

In addition to all types of airline traffic, the aeronautical point-to point circuits handle weather, air traffic control messages, and notices to airmen filed by our own and other government agencies. The CAA contracts with ARINC for the aeronautical point-to-point service used by the U. S. Government.

The ARINC stations serve foreign airlines as well as all U. S. airlines and aircraft operators, with the New York station regularly serving thirteen airlines and the Miami station more than thirty. International carriers served by ARINC include such famous airlines as Pan American, United, Northwest, Trans World, Delta C&S, Braniff, Eastern, American, Trans Canada, Canadian Pacific, Air France, British Overseas, KLM, Scandinavian Airways, Sabena and Swissair.

J. S. Anderson, President, Aeronautical Radio, Inc.

This ARINC control point at San Francisco shows typical ground/air operating positions and equipment.

Shown here is a giant step
toward tomorrow.

Conceived and developed
by a team of Martin people
who have been working with
Navy scientists since 1946,
Viking 12 is the latest of a series of
high-altitude research vehicles.

It was designed to explore the
problems of controlled flight
in the near-vacuum conditions
of the outer atmosphere and
at speeds in excess of 4,000 m.p.h.

In this long-range Viking program,
technical problems are
continuously being solved
which support advancements that
are now being made toward the next
frontier of flight—rockets having
intercontinental ranges.

And beyond that lies space itself!

MARTIN

BALTIMORE · MARYLAND

Quotes in Review

a survey of major statements made during the past two months

"I would be remiss as a spokesman for the electronics industry if I did not voice some of our concerns. Frankly, we are puzzled as to why some of our friends in the aviation industry feel it is necessary to continually expand their electronic activities when the services, facilities and personnel are available for many of these functions within the already existing industry. Most of us are not concerned as to whether we get our business as a prime, a sub or a vendor. We have no misgivings as to systems engineering or systems procurement if it is not used as a means of making bigger companies bigger and the smaller companies smaller and will not, in times of economic pressure and cutbacks—as well as at present —result in prime contractors drawing unto themselves all of the electronics business."

H. Leslie Hoffman
President, Hoffman Electronics Corporation
Radio Technical Commission for Aeronautics

"The Department of Defense is exploring every avenue to remedy the reliability situation. We hope to give electronics engineers some important assistance in this respect within the next few months. We have established a system by which we will be able to report to each factory quarterly the record of electronic equipment failures (it own equipment) for the preceding three month period, showing reasons and other pertinent data. This should be of material assistance to industry in being able to lay a finger on specific problems as soon as they begin to register and cause trouble during field usage. This guidance will permit production line remedies, so that defects will not be perpetuated in new equipment. It will also facilitate modification and improvement programs for equipment already in use. The system will be common to all three services, permitting uniform joint collection of experience. The system will cost money, but if successful it will be worth it.

"Of course, building reliability into equipment at the factory is expensive, but it saves money in the long run. In the increasingly competitive years ahead, the firm which sells reliability in military equipment will have an important sales point."

Major General Gordon A. Blake, USAF
Director of Communications, USAF
Radio Technical Commission for Aeronautics

"We all recognize that creative and exploratory research supplies the vitality and intellectual substance on which our whole technology grows. History has shown that through creative research we can and must expect the technological breakthroughs that push ever forward our scientific frontiers. During the past four years, the Signal Corps has been most fortunate in having the assistance and advice of an advisory council consisting of some of the Nation's foremost civilian leaders in the communications-electronics field. These representatives, many serving without compensation, meet from time to time to furnish us with the benefit of their scientific understanding, engineering skill, and managerial talents. It is not too much to say that this advisory council has been instrumental, not only in accelerating the Signal Corps research and development program, but in insuring that the program is headed in the right direction.

"Broadly speaking, our research and development program can be divided into four major categories. First, the Battlefield Surveillance Program, sometimes referred to as the eyes and ears of the Army. Here we are attempting to exploit our technology to the utmost in expanding man's ability to sense the features of his environment. We must provide electronic systems for locating the enemy, for guidance of our own troops over all types of terrain, for automatically evaluating rapid changes in combat situations, and even methods for destroying the enemy included under this category. Secondly, a New Field Army Communication System. We envisage an almost revolutionary change in the organization, doctrine, and

communication means provided the field army in the future. The requirements for mobility, flexibility and communications range will be far more severe than any test we have yet encountered. Third, the field of Electronic Warfare. We must provide communications circuits which will maximize immunity from enemy jamming and at the same time greatly improve our capabilities for disrupting enemy communications. Fourth, we must develop Navigational Aids for the operation of Army aircraft in the field irrespectvie of weather conditions."

Major General George I. Back, USA
then Chief Signal Officer, U.S. Army
Radio-Electronics-Television Manufacturers Association

"The campaigns being waged throughout the world for the control and allegiance of man's mind can hardly be classified as military per se. But the struggle is proving as deadly as any war in history—particularly for those millions of souls imprisoned behind the Iron and Bamboo Curtains.

"We are fighting this war with the arsenal of truth and our principal weapons are the media of communications. Although the Soviets are exerting every effort to 'jam' this truth out of existence, our signals are getting through. By means of the Voice of America, Radio Free Europe, Radio Free Asia, and the United States Information Service, we are communicating our ideas and the principles of the basic freedoms to all parts of the world. And you gentlemen—as members of this Association—collectively and individually, are making a major contribution to victory in the cold war, just as you are leading the way in so may other areas of both military and peacetime science.

"By what specific means does the Armed Forces Communications and Electronics Association render assistance to the armed forces of our nation? You assist in many ways! By maintaining a close partnership on the highest level between military and industrial communication leaders. By providing a forum, especially through your journal SIGNAL, for the ventilation of common problems and achievements. You further assist by enabling the military to benefit immediately from civilian discoveries, and you assist in informing the public about progress in your field of endeavor. You provide trained men in time of need, and lastly—and probably one of your most important services—you provide assistance and encouragement to the youth of America to enter your chosen field of engineering.

"It is a well known fact that a high priority objective of communist subversion in this country is to place agents in key spots in the communications and electronics industries. While it is of paramount importance to discover and eject such traitors, it is more practical to attract deserving and loyal young men in the first place. Through your chapters at colleges and universities, you are attracting the best of our young men and women. Your program of awards to outstanding ROTC students and to young men at West Point and Annapolis is a commendable activity worthy of the highest praise."

George H. Roderick
Assistant Secretary of the Army (Civil-Military Affairs)
AFCEA Washington Chapter Dinner honoring Generals Back and O'Connell

"Our country, for the maintenance of its military defensive position and for the growth of its economy, needs free interchange of ideas. In America the knowhow shared by engineers, scientists, and businessmen plays a vital part in building our strength and it is an important reason for our industrial leadership. Our country can never keep ahead in a race with a potential aggressor merely by keeping secret what we know. Only by superior skills can we maintain our position. Dependence upon secrecy instead of skill would be fatal. Moreover, no secrecy can be permanent. Any attempt to block off the flow of all ideas of value to a hostile power would be to our detriment, for there is no way to bring essential unclassified information to our own people without telling the world.

"This thinking has led to two diametrically opposite bodies of opinion. One urges that in the United States we become exceedingly restrictive and greatly suppress information. The other would urge that anything and everything that one wishes to say be freely published. It seems to me that both of these err in attempting to evaluate the balance of judgment between what is necessary and what is dangerous in one fell-swoop. The problem is far too complex to do that. It seems to me therefore that recognizing these two opposing needs we will find that at a particular time it may well be wise to hold back certain information, particularly of a technical nature, for a limited period until in the course of events its contents inevitably will be more widely known—this without seriously delaying the time the information can be of general value to our people. I cannot escape the feeling that if this policy of exercising balanced judgment became one that were followed by all (armed with adequate information as to the facts that bear upon these judgments), we could serve the American public without either encroaching upon a free press or jeopardizing national security."

R. Karl Honaman
then Director, Office of Strategic Information
U. S. Department of Commerce
Society of Business Paper Editors

Airfields

DELCO SKILL DOES IT!

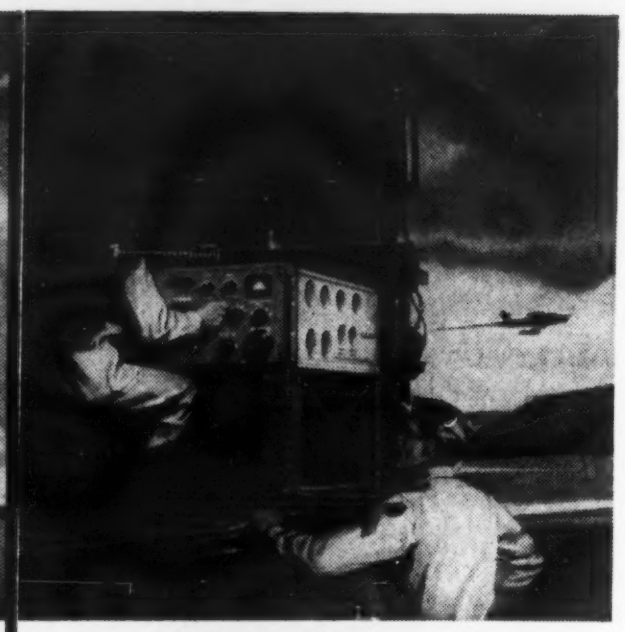
The enemy retreats, leaving behind the ruins of an airstrip, control-tower facilities shattered. Yet, only hours later, the strip smoothed over, engineers have set up a completely radio-controlled military airfield with automatic control-tower facilities. Planes are landing, homing in on the unfamiliar and, perhaps, unseen field. Their guide—the AN/TRC-32, a transportable control tower, outfitted by Delco Radio with automatic switching to 1,750 different frequencies.

s on wheels

DELCO RADIO HELPS BUILD—

T-38 SkySweeper, self-aiming anti-aircraft gun.

A-4 fire-control equipment for military aircraft.



R-390 all-purpose receiver for the Army Signal Corps.

Delco Radio's outstanding record of low-cost, high-quality mass production has been proved through 15 years and two wars, during which Delco manufactured hundreds of thousands of systems for military radio, radar and electronic equipment.

Delco is the largest completely integrated manufacturer of its kind, and because of this under-one-roof operation it produces from raw materials for less than ordinary assembly contractors.

Another advantage of this start-to-finish manufacturing to purchasers lies in centralized, simplified product quality control. Delco's own inspection demands have brought rejection rates well below minimum requirements.

Delco engineers are ready now to turn this unique manufacturing facility to greater production for defense. Let them show you the way to low-cost production of high-quality units.

DELCO RADIO
DIVISION OF GENERAL MOTORS
KOKOMO, INDIANA

DELCO RADIO HAS BUILT

- PULSED GLIDE PATH LANDING EQUIPMENT
- TAIL WARNING RADAR
- NAVIGATIONAL DRIFT INDICATOR
- ENGINE DETONATION INDICATORS
- OXYGEN FLOW INDICATORS
- LORAN RADIO RECEIVERS
- AM AND FM RADIO RECEIVERS AND TRANSMITTERS
- RADAR COUNTERMEASURE EQUIPMENT
- RAZON BOMB CONTROLS
- RT-70 RECEIVER TRANSMITTERS
- M-403 PROXIMITY FUSES
- R-390 ALL-PURPOSE RECEIVER COMPONENTS

DELCO RADIO IS BUILDING

- A-4 GUNSIGHT—ROCKET AMPLIFIERS
- T-38 SKYSWEEPER ELECTRONIC SYSTEMS
- AN/TRC-32 TRANSMITTER AND RECEIVER FOR CONTROL OF AIRFIELDS
- AN/GRC-27 TRANSMITTER AND RECEIVER

DELCO RADIO CAN HELP YOU BUILD

- VEHICULAR COMMUNICATION EQUIPMENT
- TRANSMITTERS AND RECEIVERS
- AIRBORNE COMMUNICATIONS—RADAR
- PACK OR PORTABLE COMMUNICATIONS EQUIPMENT
- ELECTRICAL COMPONENTS
- ELECTRONIC CONTROLS FOR GUIDED MISSILES

Diplomatic Communications

by Robert G. Kreer
Chief, Division of Communication Services
U. S. Department of State

and

Captain Frederick W. Giggey, SigC
Liaison Officer to the
U. S. Department of State

IN THESE DAYS OF GOVERNMENT figures of millions and budgets of billions, figures of such magnitude are no longer startling. Millions of telegraphic words annually, however, become a complex problem when the greater portion must be subjected to several different cryptographic processes, and the addresses are some 250 embassies, legations, and consulates scattered around the globe.

With an everchanging pattern in the areas of crisis in the cold war, telegraphic messages must reach into the most remote corners of the world for ready contact with every diplomatic post. To insure that they do, is the job of the State Department's Division of Communications Services.

Having no formalized communications arm such as the military services have, the State Department must avail itself of all of those facilities, Governmental or commercially operated, which will most effectively contribute to the secure, rapid and economical movement of its traffic. Because of this, the Department encounters problems such as the difficulty of finding circuits over which indivisible scrambled cipher text may be moved. This requires five unit code teleprinter channels. Happily, most United States military channels are operated on a five unit code basis and such channels are utilized to the maximum degree under agreement with the various services. An increasing number of commercial channels are being converted to this type of operation and, except for traffic to diplomatic missions in the most isolated areas, this problem is being eliminated.

To minimize the problem of a multiplicity of separate, costly, commercial transmissions to many points within the same area from the State Department's Washington center, a trunk and tributary plan has been developed. Based on traffic flow patterns, this plan enables the Department to route a high percentage of its traffic over high volume leased or military channels to an overseas point from which messages are relayed to their destinations. The plan also facilitates transmitting relatively low volume files to many points where leased or installed facilities would not be practicable. The system is perhaps best illustrated by the accompanying chart covering the Department's European network.

A leased radio teletypewriter channel connects the Department with the Paris Embassy, backed up by a leased cable circuit into London which in turn is connected by cable to Paris. From the around-the-clock relay station in Paris, most of the Western European missions can be reached either over full period leased lines or through TELEX (similar in many respects to TWX) facilities. This station is also connected to Signal Corps stations in Paris and Heidelberg pro-

Below is the Paris Embassy Relay Center showing the transmitter banks and their associated multiple transmission switching panels at the far end of the room. At the right is the versatile switchboard, equipped with relays for all circuits in order that polar and neutral circuits can be interconnected.

viding an additional outlet to the worldwide Army Command and Administrative Network (ACAN). Smaller stations at the Copenhagen and London Embassies serve as secondary relay centers.

Of interest in the Paris center is the specially designed semi-automatic, torn-tape equipment with two somewhat unique features. A multiple address position is provided, from which in a single transmission any combination of sixteen tributaries may be selected by pushbutton to receive the message simultaneously. Each circuit receives its individual channel sequence number automatically, prior to the release of the message. The second feature is the switchboard arrangement under which all incoming circuits terminate in relays and all outgoing circuits are keyed by relays. This permits interconnection of circuits and local terminal equipment on polar or neutral operation with a variety of line operating currents. Most of the leased circuits are also keyed at the American standard of 45.5 bauds, rather than the European 50 bauds, in order to permit cross connection into the transoceanic radio circuit for direct conference connection between the posts so served and Washington.

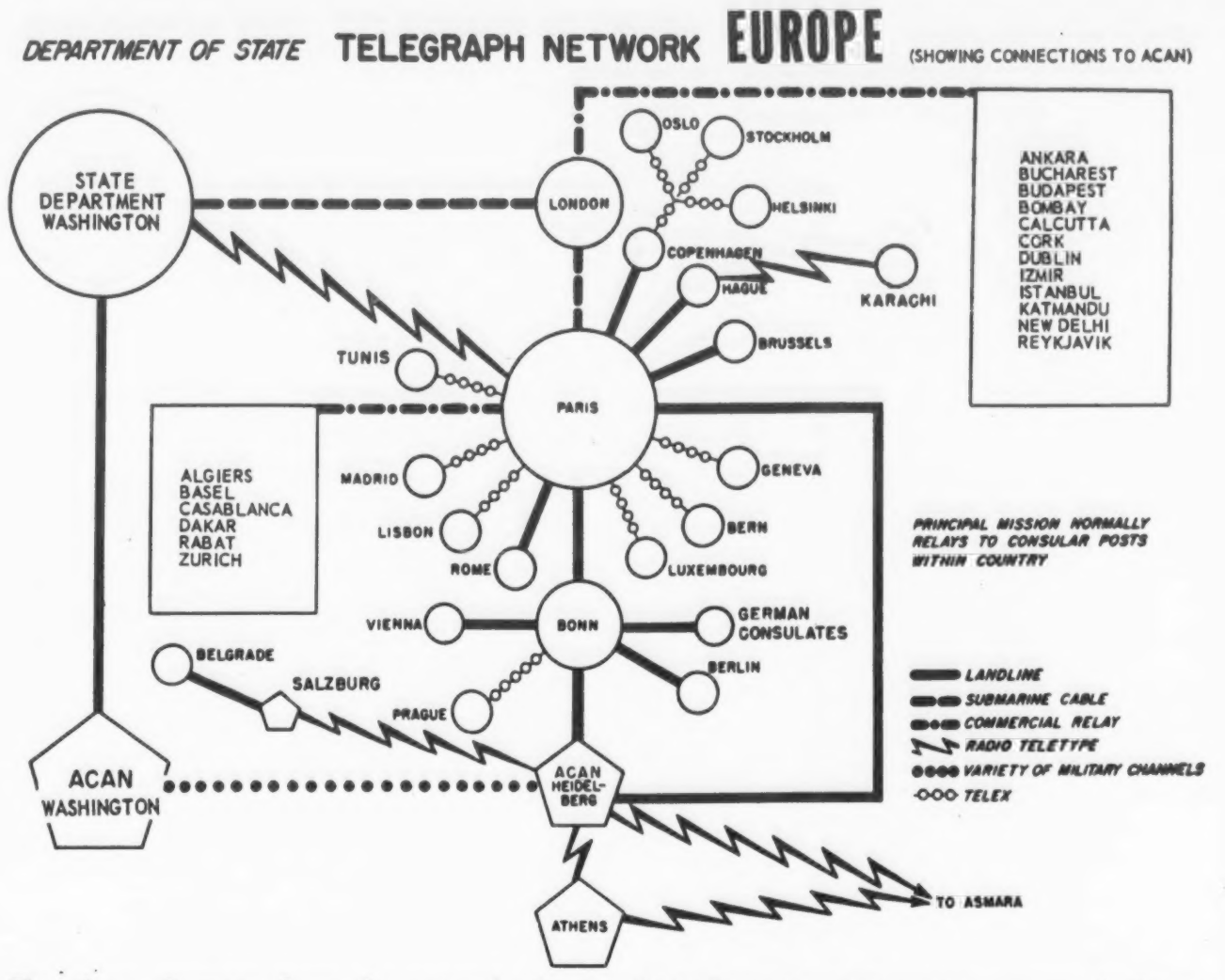
The trunk routing scheme provides rapid and economical service to most of the important diplomatic posts and fortunately the preponderant message volume is with such points and other capital centers offering excellent commercial telegraph service 24 hours a day.

Problems in Remote Areas

There still remains, however, the problem of reaching the remote mission where service, at best, may be slow and undependable. Specific cases, such as truly urgent messages for the mission in the depths of Africa or Asia, cause a large share of State's communicators' headaches.

One very attractive solution would be the installation and maintenance of a network of low powered diplomatic radio stations working out of selected central overseas points with sufficient capacity to assure the rapid and secure handling of at least high precedence traffic at any hour of the day or night. Such a network would not represent much in the way of investment in either equipment or personnel and would in all probability be limited to those posts not served by adequate commercial channels.

Aside from the practical problems of frequencies, manpower, etc., movement in this direction would be impeded by the current interpretation



The above diagram shows the network plan for State-Department-European communications. ACAN refers to the Army Command and Administrative Network, operated by the Signal Corps.

of the Federal Communications Act of 1934. This prohibits the granting of licenses to aliens or representatives of aliens for the operation of radio transmitters in the United States, and at the same time assumes the requirement of license for diplomatic stations. Thus it precludes the offering of reciprocal privilege to other nations desiring to operate diplomatic stations in Washington. The United States generally would be refused similar privileges on a unilateral basis. Such a diplomatic network would complement the trunk and tributary routing plan.

In areas where the lease of trunk circuits is neither practicable nor possible, the State Department depends largely upon Signal Corps' multichannel trunk circuits to reach its overseas area relay centers. From these centers some of the traffic is refiled commercially to destination and some is transmitted by "Fox" broadcast. The Telegraph Planning Staff in Washington is kept posted on the current lateral rates between the various posts and the relay centers in order that they may take advantage of the lowest prevailing charges for dependable service.

The regular traffic pattern itself fluctuates widely with changes in the focal point of world interest and activity, and it is further distorted by short periods of intense activity during significant international meetings or conferences. These, fortunately, are most likely to materialize in the principal capital cities but occasionally pose an interesting communications problem by convening in such places as Quitandinha, Brazil and Munsan-Ni, Korea, or other spots equally ill-prepared for large volume, high precedence international telegraphic communications.

Cooperation Essential

The cooperation of American telegraphic carriers and of the military services certainly deserves mention in this connection. Where American carriers have existing facilities or connections which do not usually operate full time in such out-of-the-way locations, they have voluntarily increased to full period maximum capacity to accommodate diplomatic traffic during periods of unusual demand.

The Signal Corps and the other military services have likewise assisted at many conferences where they had existing facilities. A good example of this was during the Munsan-Ni Korean Peace Talks in 1953 at which the Secretary of State and a staff of high level advisors were present. The Signal Corps was able to offer rapid service to Washington and other points interested in the talks, including direct teleconference facilities to Washington.

At the Bermuda Big Three Conference in December of 1953, where the President and the Secretary of State were both present, a joint Army-

(*Continued on page* 126, *col.* 1)

USAF Strategic Communications System

THE UNITED STATES AIR FORCE STRATEGIC Communications System is a world-wide, long-range, point-to-point and air-ground communications system designed for control of world-wide air operations. It consists of an integrated system of Air Force radio channels, necessary terminal equipment, relay facilities, communications centers, and cryptographic centers. It does not include tactical and special purpose communications systems, except as specifically designed by Air Force Headquarters.

The broad Air Force policy objective is to integrate all Air Force communications facilities except tactical into one system, so as to achieve efficient control of air operations and the effective and economical utilization of common facilities for both administrative and operational communications. Air Force Headquarters formulates the over-all policies, plans and programs with respect to the installation, removal, or change of circuits.

It should be made clear at the outset that Air Force communications are not planned or operated in isolation from the other Services. Although it may appear that each Service operates a separate system, actually it can be considered as one large system, segments of which are operated by, and are responsive to, the needs of a particular Service. Many of the stations are joint facilities, with two or three Services co-located. All of the major stations are inter-connected to permit interchange of traffic and alternate routing.

System Planning for Flexible Operations

The primary purpose of the USAF Strategic Communications System is to provide efficient and effective control of air operations. Secondarily, it provides the Air Force an over-all system of operational, logistical, and essential administrative communications. The almost completed System will provide world-wide operational and administrative communications requirements.

Improved, expanded, and consolidated systems have been dictated by the rapid and complex advancements of our global Air Force. The development of high-speed, long-range aircraft with the accompanying increase in personnel, numbers of aircraft, and density of new bases throughout the world creates some of these requirements. In addition, the expansion in scope and mission of the aircraft, crews, associated equipment, and support facilities have further complicated the task of providing fast, accurate, standardized, and flexible communications. These requirements have fostered the development of the Strategic System. The facilities which constitute the System must be flexible, so as to support not only present operations of the Air Force, but also to support current capabilities under emergency conditions and anticipated capabilities created by future changes in techniques and technology.

System planning has been accomplished on the basis of maintaining system integrity. If the system is to succeed, this concept must be continued throughout the future planning, construction, and operation of each individual facility. This need is further emphasized by the urgency of obtaining maximum returns from all resources such as funds, material, personnel and frequencies placed at the disposal of the Air Force. The facilities of the system are available to the component air commands in accordance with their needs in fulfilling the overall Air Force mission.

Actually, the system is not as much an operating network as it is an integration and alignment of other, smaller networks.

The Teletype Communications Network (*AIRCOMNET*), is a world-wide, integrated, teletype, tape-relay network which is designed to carry Air Force command and administrative messages. The AIRCOMNET consists of leased commercial radio and wire circuits; leased commercial teletype reperforator switching equipment which is Air Force operated; Air Force owned and operated teletype and radio facilities, and U. S. Army and Navy radio and wire circiuts allocated for Air Force use. AIRCOMNET facilities are available to all agencies of the Department of Defense on a common-user basis and to some other government agencies.

The Global Air-Ground Communications System is a world-wide system representing the link between ground stations and aircraft. Each ground-air station is a tributary of an AIRCOMNET relay station and thus is considered the air extension of point-to-point circuits in the AIRCOMNET. The global ground-air system is available to all Air Force commands and is not intended as a primary system of any one command. The purpose of this system is to provide the link to pass tactical, strategic and traffic-control information and instructions between command posts, operational bases, air-traffic control centers and aircraft.

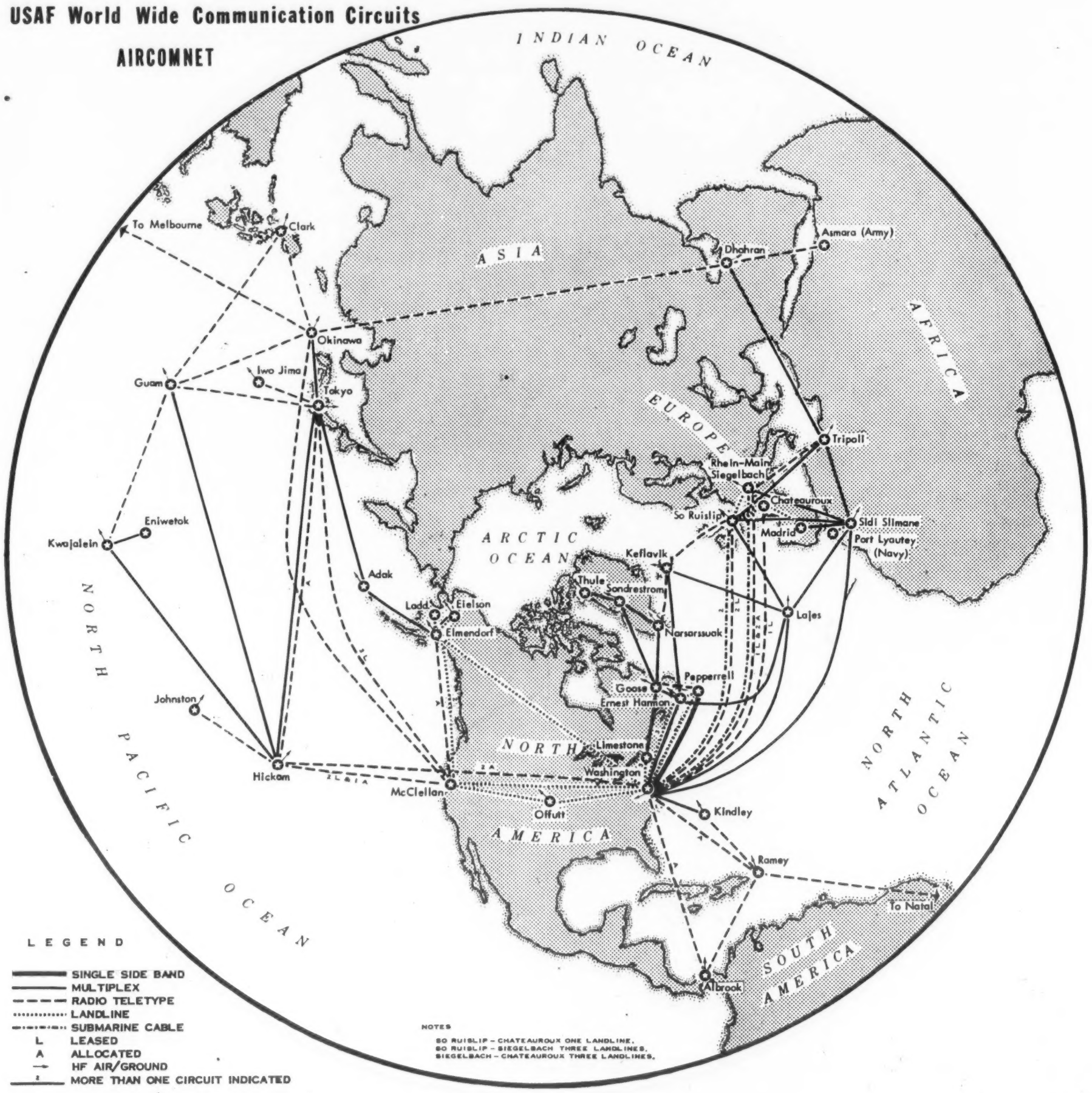
The purpose of the *Weather Teletype and Facsimile*

In explaining the Air Force set-up in detail, the author has emphasized the global network which provides outstanding communication services for all commands.

by Colonel George M. Higginson, USAF

USAF World Wide Communication Circuits

AIRCOMNET



Systems is to support the Air Force in the goal of achieving an "all-weather" Air Force. The communications services (broadcast, teletype, and facsimile) provide the facilities for preparation, analysis, evaluation, and interchange of weather data around the world. The integrated weather commmunications systems permit the required functions of collecting, collating, and disseminating meteorological information and data.

The Air Operational Network (*AIRCOMNET*) is maintained to provide specialized operational services necessary for the safe completion of military flights. It also supports the communications requirements of air transport operations. This network is an integration of the old Flight Service Communications System and the MATS Private Line Network. It is an integrated network of leased teletype circuits connecting using agencies. The network is designed to provide expeditious handling and delivery of all operational messages dealing with the movement of military aircraft.

The Security Service Network is composed of leased long lines, TWX facilities, and allocated channels of AIRCOMNET. The network is provided for the discharge of the mission assigned to the Security Service.

The Strategic Air Command Communications System provides close-knit command and administrative control of bases in overseas theaters and within the U. S. It is composed of the following networks or sub-systems:

SAC Communications Network (SACCOMNET)
SAC Operational Telephone Network
SAC Telephoto Network (SACPHOTONET)

These systems or networks are considered as separate entities; individually, however, each is part of the overall Air Force Strategic Communications System and therefore follows the standard operational procedures specified for the system. Part of the Air Force objective is the further consolidation of several of these teletype systems into the AIRCOMNET, by the use of additional equipment and facilities in the major AIRCOMNET centers.

In addition to these Air Force systems, channels and services are provided to the Army, Navy and other government agencies. And of course some of the channels in these systems are provided to the Air Force by other services, or are leased.

Air Force commanders and their subordinate echelons control and operate the terminal facilities. However, they neither operate nor control the intermediate radio, wire and relay facilities. These are provided to them in the Strategic System as common user channels, private line channels and special purpose channels, to meet their requirements. The Air Force could not afford, and the frequency spectrum could not accommodate, separate networks for each of these global missions.

This microwave terminal equipment is installed in the terminal equipment room at the GLOBECOM relay center.

Antenna Farms at Transmitter Sites

The "Beltline" is the foundation of the system. It is formed by major relay stations interconnected by high-power, multi-channel radio circuits. The locations of these key stations were chosen to provide physical security and maximum freedom from radio-propagation disturbances, consistent with the need for supporting world-wide operations of the Air Force in peace and war. The Beltline provides the primary channels along which communications flow to and from the United States and overseas theaters and between theaters.

Each of the Beltline stations is connected with appropriate major and minor relay stations and/or tributary stations serving the various activities, headquarters and air bases. At each Beltline station and at other select stations, several ground-air HF voice channels have been installed for long-range communications with aircraft.

The transmitting equipment of the Beltline stations includes equipments necessary to provide circuits to other Beltline stations, to other relay stations, and to satisfy the air/ground, the broadcast and other local requirements.

A typical transmitter site consists of an antenna farm of approximately 460 acres, remoted from the communications center by 10 to 20 miles. The transmitter building is built in the form of a cross, to take advantage of optimum transmission-line installation. Three of the wings house equipment, while the fourth wing provides living space and messing facilities for approximately 40 men.

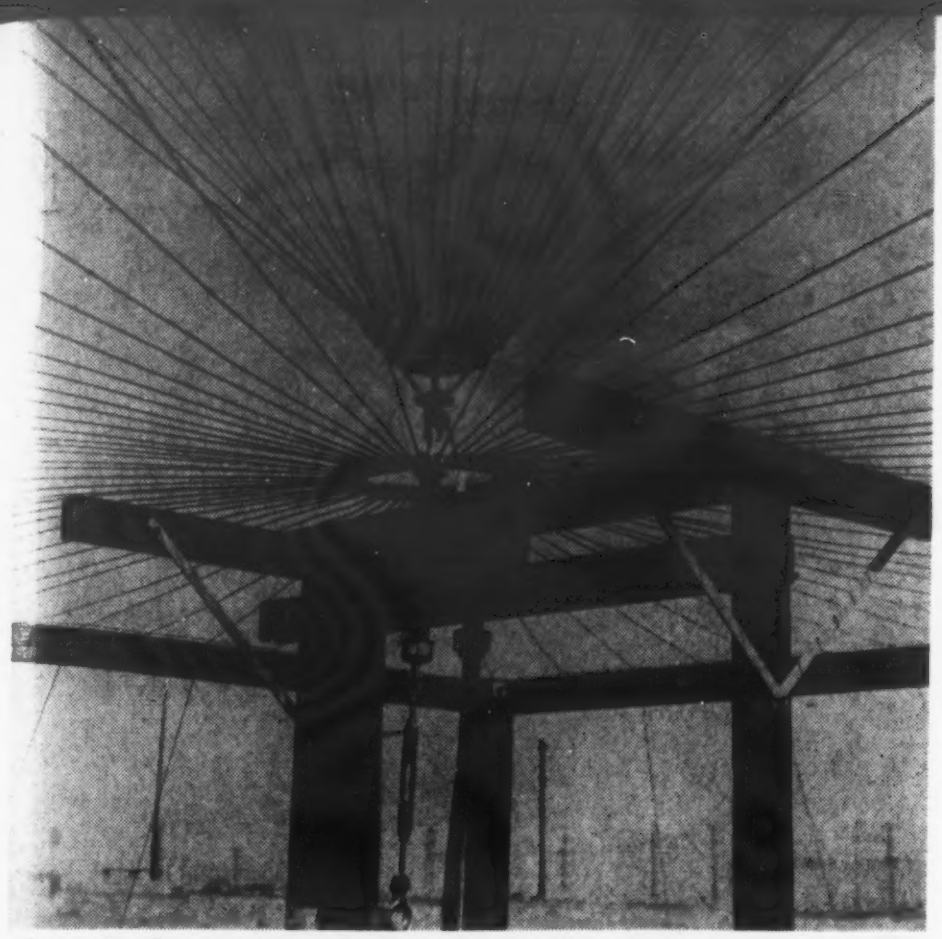
A master control console, located at the junction of the wings of the building, provides for flexibility and interchangeability of the transmitting equipment. A microwave link system provides the necessary keying lines to the communications center. Diesel power units are housed in a separate power building. The power units are normally 350 or 600 kilowatts.

A typical receiver site consists of an antenna farm of approximately 640 acres, remoted from the communications center by approximately 10 to 20 miles. Normally, the receiver site is separated from the transmitter site by 15 to 30 miles. The building is constructed in the form of a modified cross and includes housing and messing facilities for the technical personnel. Power is provided by a 100 kilowatt diesel power generating plant, housed within the receiver building.

By virtue of its gain and directivity characteristics, the rhombic antenna was chosen for long-distance point-to-point circuits. Rhombic antennas are therefore used for both receiving and transmitting on circuits of 600 miles or more.

Where an appreciable number of rhombic antennas are to be used, several factors make it difficult to determine land requirements. Any disturbance which affects the electrical balance of the rhombic antenna will distort the directive characteristic. Any structure capable of absorbing electrical energy and placed in the vicinity of the antenna system can disturb this balance unless the structure happens to be so placed and so shaped as to affect both sides of the antenna equally. In that case while there may be no distortion of the directive characteristics, there still may be undesirable absorption of energy.

In order to protect directive antennas from these effects



Above is the apex termination detail of a discone antenna. This GLOBECOM design is in operation at the McClellan transmitter site.

they must obviously enjoy a certain degree of isolation from other antenna systems or electrical energy-absorbing structures.

Since the operating frequencies for the HF long distance point-to-point circuits will in the course of the day, season and year vary over a wide range, the antenna system must be capable of efficient operation over that range of frequencies. It is not possible to design an antenna to be reasonably effective over a range much in excess of two to one in frequency. Since the operation over most circuits over the eleven-year sun-spot cycle will require frequencies over the greater part of the 3 to 30 mc band, the band must be split and a proper antenna designed for each portion of it. This means two transmitting antennas per circuit at the transmitting terminal. At the receiving terminal where the diversity advantage is required there must be four antennas per circuit operating in diversity pairs with each properly designed for a portion of the operating frequency range.

Pairs Used for Space-Diversity Reception

Doublet antennas are used for transmitting on point-to-point circuits of less than 600 statute miles, and are considered the primary transmitting antennas for all air/ground channels.

The use of multi-channel transmitters pretuned to ten different frequencies in the HF band as a back-up for the primary air/ground transmitters presents a requirement for a broad band antenna. This has to be fed at any frequency between 3 to 30 mc without need of adjustment and have matching characteristics to a 72 ohm coaxial line such that the standing wave ratio throughout the HF band will be 1.5 to 1 or less.

By mathematical analysis, it has been determined that a discone type antenna was most likely to meet the requirement above. The final dimensions of the discone antenna are approximately 90 ft. in height, with an apex angle of 70°.

The discone antennas, besides being used for the air-ground backup multi-channel transmitters, are also used for receiving on all point-to-point circuits of less than 600 statute miles, for receiving on all air/ground channels, and for other intercept operations.

All antennas used on point-to-point circuits are designed for a particular portion of the frequency range required by the path characteristics of each circuit. This practice permits the use of separate antenna for test of frequency changeover, and insures a better radiation system for each portion of the operating frequency ranges. All of the antennas are capable of being switched to any equipment in a group, to permit utmost flexibility.

For many of the point-to-point circuits, receiving antennas are installed in pairs, to permit space-diversity reception. In the cases where more than one circuit has about the same azimuth path, one antenna system is used for all the receivers of those circuits. This is accomplished by means of branching amplifiers, or multi-couplers. Similarly, the receivers for the air/ground and intercept services are fed from a common broadband antenna system. To keep the entire receiving system very flexible, all input and output circuits of all equipments terminate on jacks in the main patching and distribution bay. All of the coaxial antenna feed lines terminate at the same location for maximum utilization.

Communications Center

The Communications Center is the junction point of all transmitter and receiver circuits. Microwave relay equipment is generally used to tie the communications center to the remote transmitter and receiver locations. This operates in the 7000 megacycle range and by multiplex techniques is capable of providing up to 24 voice channels, each of which can be sub-divided to accommodate narrow channel requirements.

Also located at the Communications Center are the tape-handling facilities; the cryptographic equipment air/ground operating positions; the master control; and the main terminal equipment room for the station.

Input and output circuits of all equipment are terminated on the main distribution frame in the channel and technical control room. The main patching and distribution bays are located in front of the frame, and they control all of the jacks terminating the circuits from the frame where all cross-connections are made. The Technical Control Center correlates all operations of the System. It provides the capability of initiating direct circuit patches between stations, and provides alternate traffic routes. By use of precision test equipment, Technical Control monitors the quality of circuits; it directs frequency changes, and in general, controls the entire installation.

The major relay centers in the U. S. are presently equipped with semi-automatic switching equipment. Auto-

(*Continued on page* 125, *col.* 1)

A technician checks these tape storage banks in the teletype center at a GLOBECOM relay center.

It takes two kinds of POWER

. . . to keep them flying!

It takes tremendous power to fly faster than the speed of sound. It takes unfailing electric power, too . . . racing with the speed of light to operate the complex mass of electronic instruments and control devices packed within the sleek skin of modern military aircraft.

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During the Korean conflict, Signal Corps linemen strung miles of wire needed to implement communications operations. Much of this work was done close to the frontlines, as in the photo at right.

World-wide Communications for the Department of the Army

by Brigadier General Walter B. Larew, SigC
Chief, Army Communications Service Division

THE FORERUNNER OF TODAY'S MODERN GLOBAL communications of the Signal Corps was the magnetic telegraph system, first installed in 1860. Five years later, at the end of the Civil War, the Corps began laying thousands of miles of telegraph wire in the Western wilderness and established and operated stations to connect these new frontier settlements. In a few years, Signal Corps telegraph communications connected these outposts of civilization with Army posts until commercial communication companies were in a position to furnish service.

It was not until 1900, however, that Army communications began to take on a somewhat "global" look. On May 26, 1900, Congress approved the construction of a system of telegraph and cable links in Alaska. The Signal Corps undertook construction of the system in the face of tremendous obstacles of terrain and weather. This circuit was known as the Washington-Alaska Military Cable and Telegraph System (WAMCATS). The first telegraph line was built at Nome to Port Safety, and the Signal Corps commenced service over the line on September 1, 1900.

In 1936, the name was changed from the Washington-Alaska Military Cable and Telegraph System to the Alaska Communications System (ACS). Virtually every known type of communication service is provided by the

System, with about sixty-five per cent of the operation over radio-telegraph and radio-telephone, and the remaining thirty-five per cent by wire circuits. In the latter case, wire telephone and telegraph facilities and circuits are provided by submarine cables from Seattle to the coastal communities of Alaska.

The Alaska Communications System also utilizes the wartime-built ALCAN Highway telegraph and telephone system from Edmonton, Alberta, to Fairbanks, Alaska. Main trunk lines extend from Whittier and Anchorage to Fairbanks along the Alaska Railroad, and, as stated, from Fairbanks to the United States via Edmonton and the ALCAN Highway. Another main route extends from Skagway along the White Pass and Yukon Railroad, connecting with the ALCAN Line at White Horse.

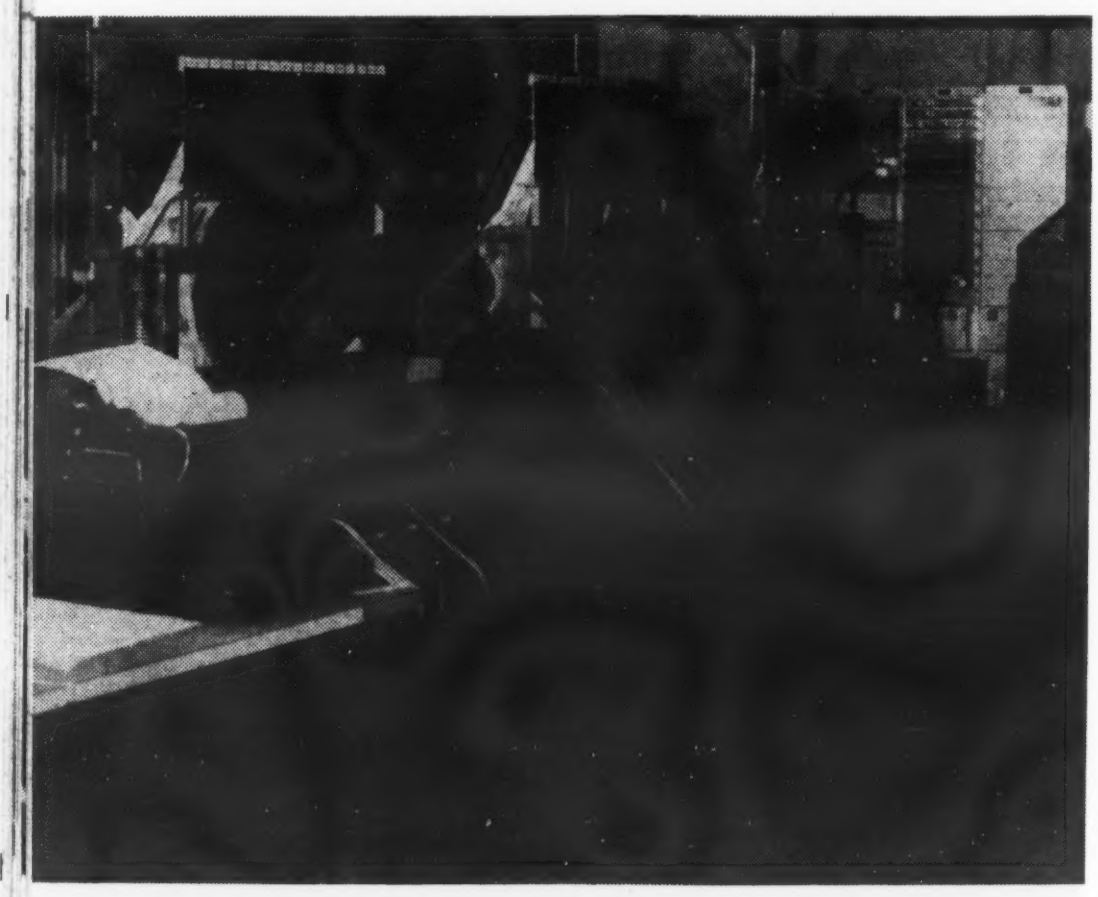
War Provoked Global System

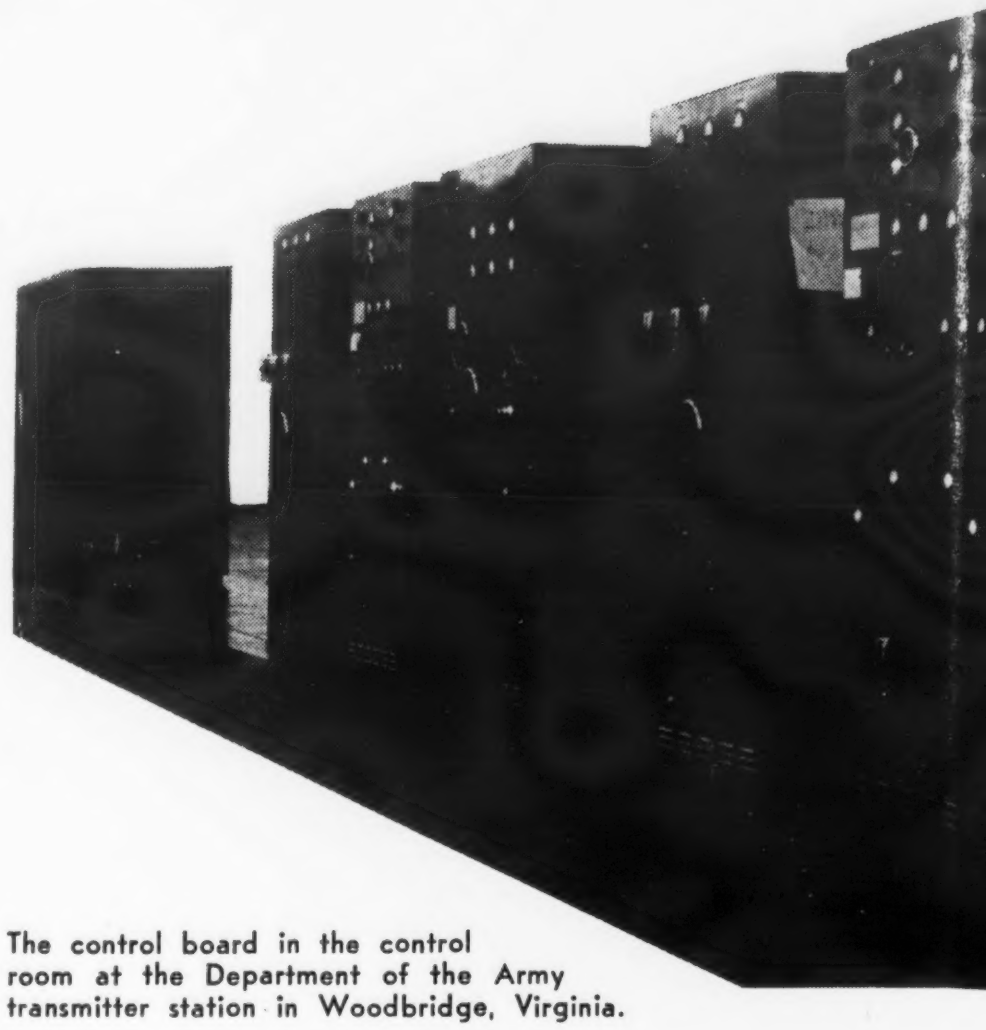
The Alaska system has thus grown from some twenty miles of telegraph line in 1900 to an extensive network of radio and wire facilities serving 586,460 square miles of territory. The system provides long lines service for civilians, the military, and many other Governmental agencies in Alaska. It is under the control of the Chief Signal Officer and operated for him by Headquarters, Alaska Communications System, at Seattle, Washington.

During World War I, the first trans-Atlantic radio station was established by the Signal Corps; but it was not until World War II that the Signal Corps communications developed a truly global look. The global war required a global communications system to reach into every corner of the world. Such a system was the only possible way the Department of Army could keep in touch with its far-flung overseas operations.

At the outbreak of World War II, Army communications at home, and to one or two overseas points, were handled via the Army Radio Network. This network consisted of manual and automatic Morse point-to-point facilities. It was not adequate for handling the increased traffic loads caused by hostilities. It therefore became necessary to expand and modernize this network to meet unprecedented military traffic requirements. A gradual changeover was started to improve means and methods of communications. IBM radio-type equipment was

The automatic number transmitters and teletypewriters setup in the communication center primary relay station at Karlsruhe, Germany.





The control board in the control room at the Department of the Army transmitter station in Woodbridge, Virginia.

placed in use on an experimental basis in August, 1941. This equipment was so designed that a perforated tape placed in a roller-type transmitter at one end of a radio circuit would be reproduced at the distant station in page-copy form. By October 1942, IBM equipment had been installed on several circuits. This, of course, was a radical departure from any previous method of handling messages by radio means. Teletypewriter point-to-point operation also was tried in 1942 but the bulk of equipment and personnel requirements were such that this method of operation was not entirely satisfactory.

Semi-Automatic Teletypewriters

About this time, other types of equipment were tested. including the Q-102 reperforator. This equipment was so designed that messages were received in printed perforated tape form instead of page-copy, and transmission was accomplished by inserting a prepared tape in an associated transmitter distributor. This made it possible to utilize an incoming tape received on reperforator equipment for re-transmission to other points without manual processing. However, Q-102 tape reperforator equipment installations became too cumbersome to handle effectively the tremendous volume of military message traffic. This led to the development by the Signal Corps of semi-automatic teletypewriter equipment.

The semi-automatic equipment was manufactured in compact units, including eight receiving typing reperforators in a single table in two rows, one atop the other, for transmission of messages. The semi-automatic equipment conserved floor space and permitted a reduction in operating personnel. Also, the equipment proved ideal for expeditious routing and relay of messages in tape form. As the tape relay method developed, incoming circuits were studied and so arranged as to be directly opposite transmitting positions associated with teletypewriter stations for which the majority of traffic was destined. This speeded up the over-all relay of message traffic and reduced physical handling of tapes to a minimum.

By September 1943, semi-automatic teletypewriter equipment was in place at several locations in the United States and "packaged units," which embodied the prin-

ciple of semi-automatic equipment, were developed and shipped to Army installations overseas. Thus, the Army Command and Administrative Network was born.

Today the Army Command and Administrative Network, more commonly referred to as the "ACAN," extends from Washington to Asmara, to Tokyo and the Philippines. Circuits reach many points in Europe, Hawaii, and the Panama Canal Zone. The hub of the network is the Department of Army Communication Center located in the Pentagon Building.

ACAN is composed of many primary, major, and minor relay stations and several-hundred tributary stations scattered all over the world. The network provides record communications for the Department of Army and, on an exchange basis, for the other military departments.

Reports from the Field

The circuits which link the continents are usually some type of multi-channel radio facility. Those within the United States are, in general, long line teletypewriter circuits leased from the various commercial carriers. Multiple radio-teletypewriter channels are derived from single sideband and multiplex systems. Some time ago, the Signal Corps developed a method of deriving twelve channels from six-channel single sideband terminals. No additional frequencies are required which is all-important because of the critical shortage of frequencies. Application of this method has demonstrated its effectiveness, not only in increasing the number of channels, but also by increasing channel availability because of the inherent advantages of space diversity.

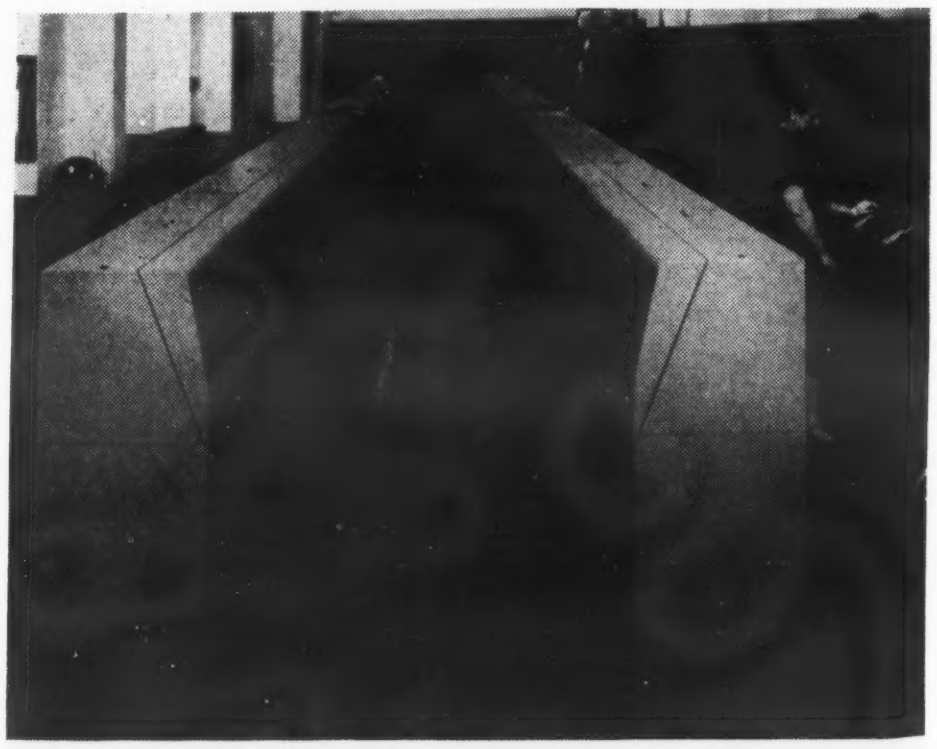
All ACAN circuits are closely engineered to effect economy wherever practicable through maximum utilization of personnel and equipment. "Telecommunications Engineering Reports" are the basic engineering yardstick by which the Chief Signal Officer measures the world-wide performance of the system. These reports, received monthly from the field, are carefully machine tabulated, analyzed, and posted on circuit record cards. Under constant review, this information indicates to Signal Corps traffic engineers where system changes, improvements, and economies can be effected.

By using many alternate routes for the tape relay of message traffic, the ACAN maintains unusual flexibility. For example, when radio propagation difficulties are experienced over a given path, messages can be routed over alternate circuits traversing entirely different paths. Thus, while a direct circuit may be out of service, messages go through, even if it is necessary to route them half-way around the globe.

The value of flexibility is well illustrated by the Korean conflict. When hostilities commenced, it was necessary once again to handle a large volume of military traffic. It was also necessary to extend the ACAN lines down to the American divisions fighting in the front lines. Radio and cable facilities were established between Korea and

Signal Corps personnel check the tape relay machines in the comcenter at the Signal Corps training center, Camp Gordon, Georgia.

At Fifth Army headquarters in Chicago, Illinois, the first fully automatic teletypewriter relay center has been installed. This faster system will soon replace semi-automatic installations in many comcenters.



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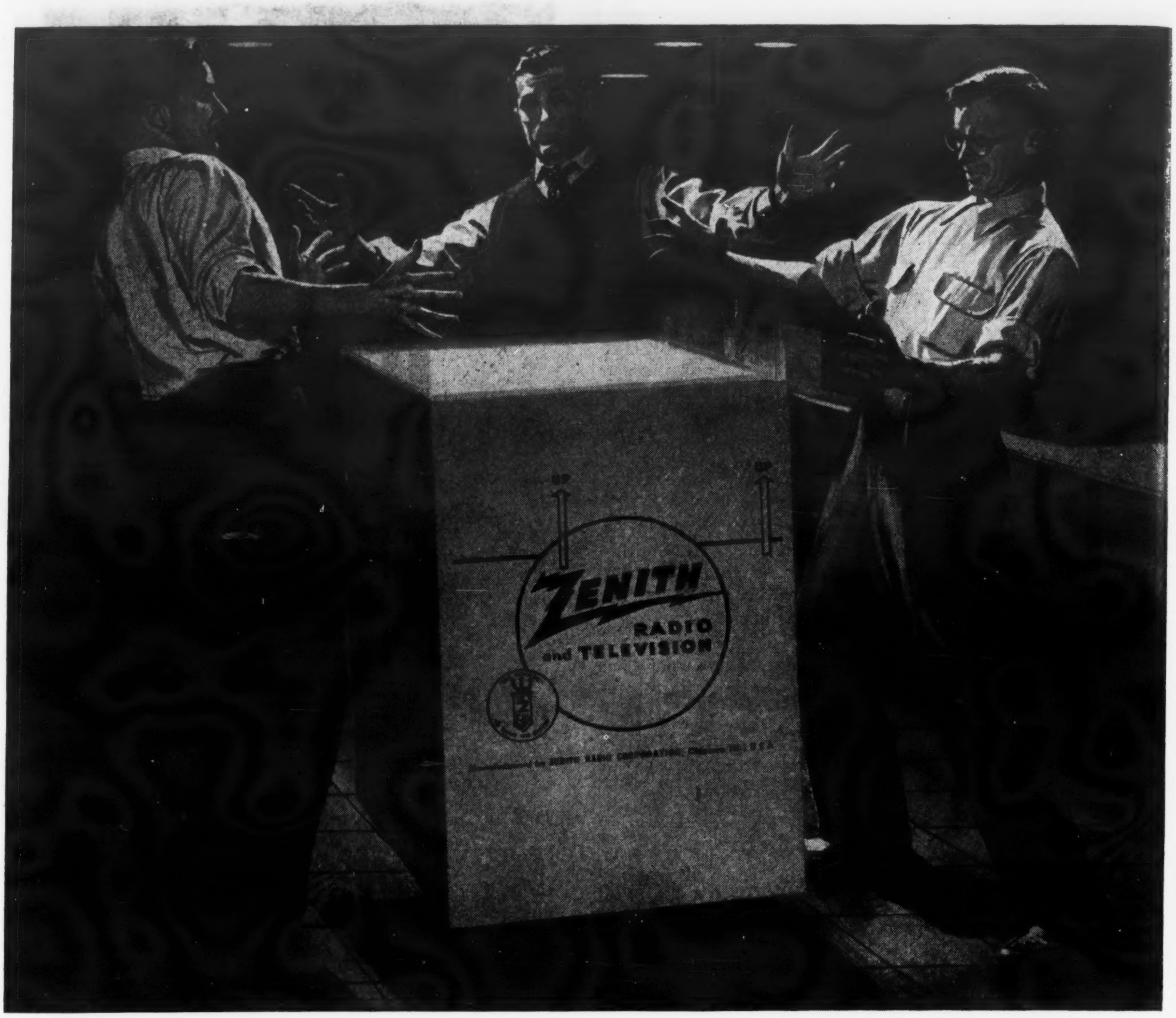

They get paid to wreck Zenith's products!

THERE ARE MEN who actually spend all their working hours deliberately trying to wreck precision-built Zenith products.

We have found these people purposely dropping packed radio and television sets three feet onto a concrete floor. They put radios in a "steam bath". They subject many defense products to extremes of temperature, humidity, and salt spray. Or they might put any Zenith product in a machine that shakes and punishes it mercilessly—the equivalent of 5000 miles of *roughest* travel.

And we pay them to do it! We like to be sure that our products will take the worst that can happen to them, even though they'll be pampered and treated with care by their ultimate owners.

Sets must be transported by truck or train to their destinations, and that means a lot of shaking. A Zenith Trans-Oceanic® Portable Radio often turns up in a steaming jungle—or in the arctic. Defense products may turn up anywhere in the world.

That's why at Zenith some men spend their full time trying to wreck Zenith sets. If they succeed, and the sets don't measure up to the highest standards of Zenith quality, even more protection is built in.

This is an integral part of our "Quality Assurance" program.

The same care in manufacture, the same "Quality Assurance" program, is carried through all Zenith production—both civilian and defense. This is one reason why Zenith is called on so often to help develop better weapons of defense for the Government.

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Japan. From there traffic could be handled over several routes into the Department of Army.

The first American ground troops sent to Korea, and the first casualties, were Signalmen, indicating the impact with which the action affected the U. S. Army Signal Corps. In the early days of the campaign, Communist break-throughs and guerilla attacks on Signal Corps lines and positions were almost daily occurrences. Signal Corps positions were over-run, with Signal troops fighting like Infantry in their dual role as both a combat arm and a Technical Service. The terrain of the peninsula made it one of the worst areas in the world for radio communication. In addition, no such thing as an extensive modern communication system existed. This meant no nucleus upon which to build. Thus the reader needs little imagination to appreciate the difficulties experienced in keeping front line commanders in touch with the Department of Army at Washington.

Automatic System Installed

It was stated earlier in this article that ACAN is a torn-tape relay system, employing semi-automatic equipment. However, the semi-automatic equipment will be replaced at some installations by fully-automatic equipment in the not-too-distant future. Working closely in conjunction with private industry, the Signal Corps has developed a fully-automatic tape relay system. A twenty-line pilot model went into operation in November of 1952 at the Fifth Army Headquarters major ACAN relay station in Chicago. This is the forerunner of larger systems to follow. In fact, the first one-hundred-line automatic system is scheduled to be installed this year at the Sixth Army ACAN relay station near San Francisco.

Some of the features of the automatic system include the use of common and pooled equipment to effect maximum economy and efficiency, and the handling of message traffic in accordance with assigned military degrees of precedence. In effect, the automatic equipment reads routing indicators and precedence and handles the traffic accordingly. "Priority," and lower precedence military traffic in the process of transmission, is interrupted to permit immediate transmission of high precedence traffic.

Above is an Army teletypewriter installation during field maneuvers. Heavy traffic, similar to actual combat conditions, is experienced during these full scale exercises.

Technically, the equipment is more complex than semi-automatic teletypewriter equipment. However, the fully-automatic equipment requires fewer operators and is easily maintained. For example, all relay bases are jack-mounted. Clearing trouble on the operating floor becomes a matter of broad localization and quick replacement of the defective base. Alarm circuits showing equipment conditions and electrical checks on the progress of each message are built into the system.

The Signal Corps is searching constantly for better equipment and improved methods to provide the best possible global communications for the Department of Army at the least possible cost. With the continued assistance of the communications-electronics industry, the Army of the future will remain the best equipped in the world. *Pro patria vigilans.*

- - - — - —

Below is a photograph of the relay station in the communications center at the Army headquarters in Tokyo.

INCOMPARABLE *Frequency Stability...*

for Airborne X-Band Radar Receivers

Now — at a New Low Cost — Varian announces the rugged VA-203 . . . most advanced reflex klystron ever developed for airborne radar and beacon local oscillator service. The exclusive brazed-on external tuning cavity provides frequency stability obtainable in no other klystron. This construction provides outstanding stability during shock, vibration and temperature cycling . . . takes punishing 50 to 100 G shocks and provides absolutely reliable operation at high altitude WITHOUT pressurization.

For Super-Rugged Service (Shocks to 250G) . . . Varian offers the VA-201 klystron. This tube is equipped with integral molded silastic leads, is similar to the VA-203 and performs with the same absolute reliability.

GUARANTEED SPECIFICATIONS		
8500 to 9600 mc	VA-203	VA-201
Resonator Voltage	300 V	250 V
Heater Voltage	6.3 V	6.3 V
Heater Current	0.45 Amp	1.2 Amp
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- ★ Withstands 50 to 100 G shocks (up to 250 G's for the VA-201)
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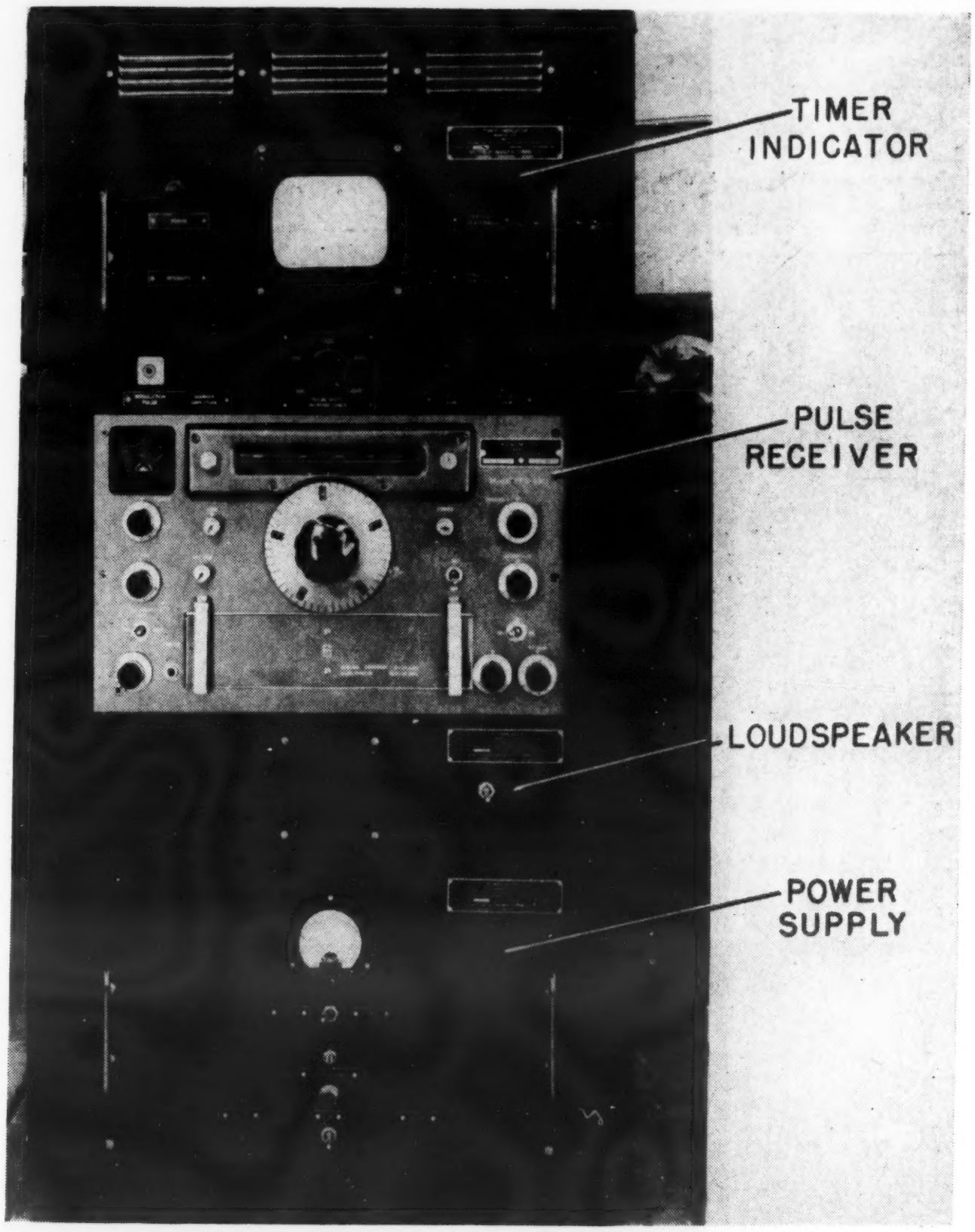
Raytheon Products for Industry and Military

by Milton G. Lambert

THE CIVILIZATION, PROGRESS, AND power of a nation have always been closely related to its powers of communication. Perhaps more than any other single factor, the communications skills enabled the white man to take possession of this land over the resistance of his red brother. The Indian was separated into innumerable, autonomous groups, each with its own language or dialect, and each without a written language. The white man spoke only three major languages, and these were easily translated from one to another by means of a common alphabet, through an abundance of interpreters.

With the progress of technology and improved methods of communications, the rule still holds that a nation's power and progress may be measured significantly by its skill and facilities for communications. We need only Soviet Russia and the United States for an illustration. A hundred years ago, a man from Maine might have needed an interpreter to talk with a man from Florida, even though they were both speaking English. Today, through modern communications including nationwide network shows on radio and television, even the regional dialects are disappearing; there is emerging a "universal accent," and Americans everywhere have no difficulty understanding each other.



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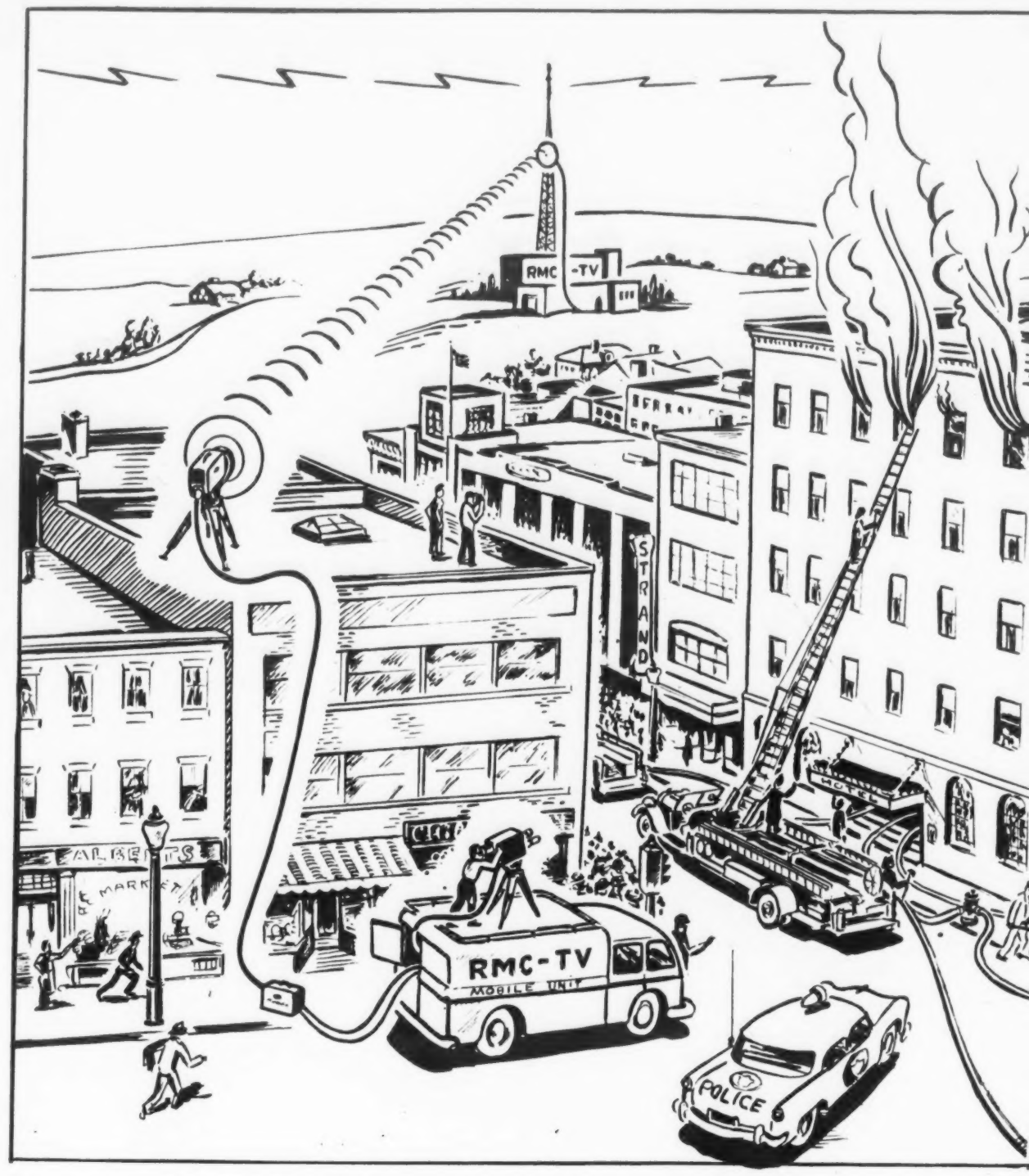
To the right is the receiver group of the Raytheon "Communications Zone Indicator" (COZI) equipment.

Across the vast stretches of the Soviet realm, there are many language barriers. Thus in a communications sense, the Russian people are at a point in their social progress roughly equivalent to that of Americans in the early 1800's. Their military communications, we may presume, are considerably better than that of the Soviet nation as a whole.

Here in America, the science of communications is not only far advanced, but the rate of progress has been accelerating rapidly, particularly within the last five years. Microwave devices hold a prominent place in that progress, and it is in this field that Raytheon Manufacturing Company, a pioneer in the design and production of microwave components and equipment, has made some of its most significant contributions.

Nearly two years ago, Raytheon placed its KTR-100 television microwave relay on the market. Hailed as the "seven league boots" of television, it is a portable equipment, light enough for one man to carry. It picks up picture and sound simultaneously and shoots them back to the studio on one waveband via a microwave band (no wires). The



This drawing shows the KTR-100 "microlink" television relay in action at the scene of a fire While the camera and microphones pick up the scene and sound, the "dish" is quickly set up on a nearby rooftop, the cable dropped over the side of the building and connected to the camera unit, and the beam is picked up by the TV studio, which may be up to 25 miles away

The Raytheon KTR-100 television microwave relay equipment is light and easily transported and installed for on-the-spot television coverage.

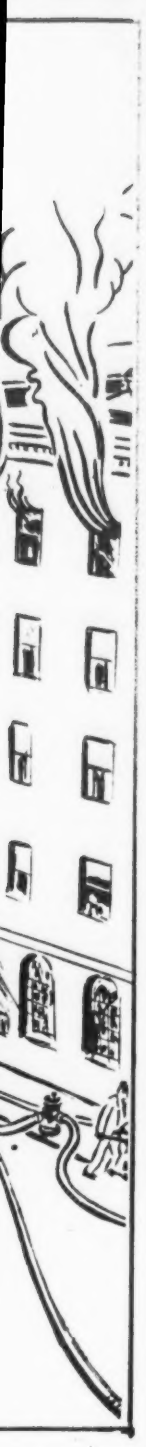
equipment also serves as a TV relay station, and handles color broadcasts as well as black-and-white, with excellent detail and fidelity.

Introduced at the same time as the KTR-100 was the "Magnalink," the world's most powerful microwave relay for television. The equipment was used for relaying the scenes picked up by the cameras at the early atom-bomb experiments on the southwestern desert after World War II, and successfully relayed images over distances of 100 miles and more in one hop.

Since the KTR-100 makes it no longer necessary to have separate provisions for the video and audio signals when a camera is operating in the field, the equipment is highly adaptable. It permits the TV camera to roam through city streets, or, to record events at the ball park, at fires, etc., while the images and sound are instantly relayed back to the studio where they are transmitted to the homes of televiewers within the station's range.

Techniques are being developed t increase the usefulness of the KTR 100 to military commanders, so tha they may watch operations on a bat tlefront from their operational head quarters. The versatility and ligh weight of the equipment makes i feasible for use in unorthodox ways It could, for example, be used for re laying messages taken from a camer mounted in an observation balloo or a blimp, provided the microwav beam remains "zeroed in" on th receiving antenna. Preliminary ex periments along these lines hav turned up several problems, but non of them is considered insurmount able.

Long-range radio communication are considered to be one of the mos difficult types of global communica tions, because unpredictable cond tions affecting the propagation o long radio waves are so variable. A mospheric conditions can be antic pated only within narrow limits, an many other variables enter the pi ture. All told, as most radiome



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know, establishing contact between a transmitter (even a very powerful one) and a receiver located halfway around the world, is at least partly a matter of chance.

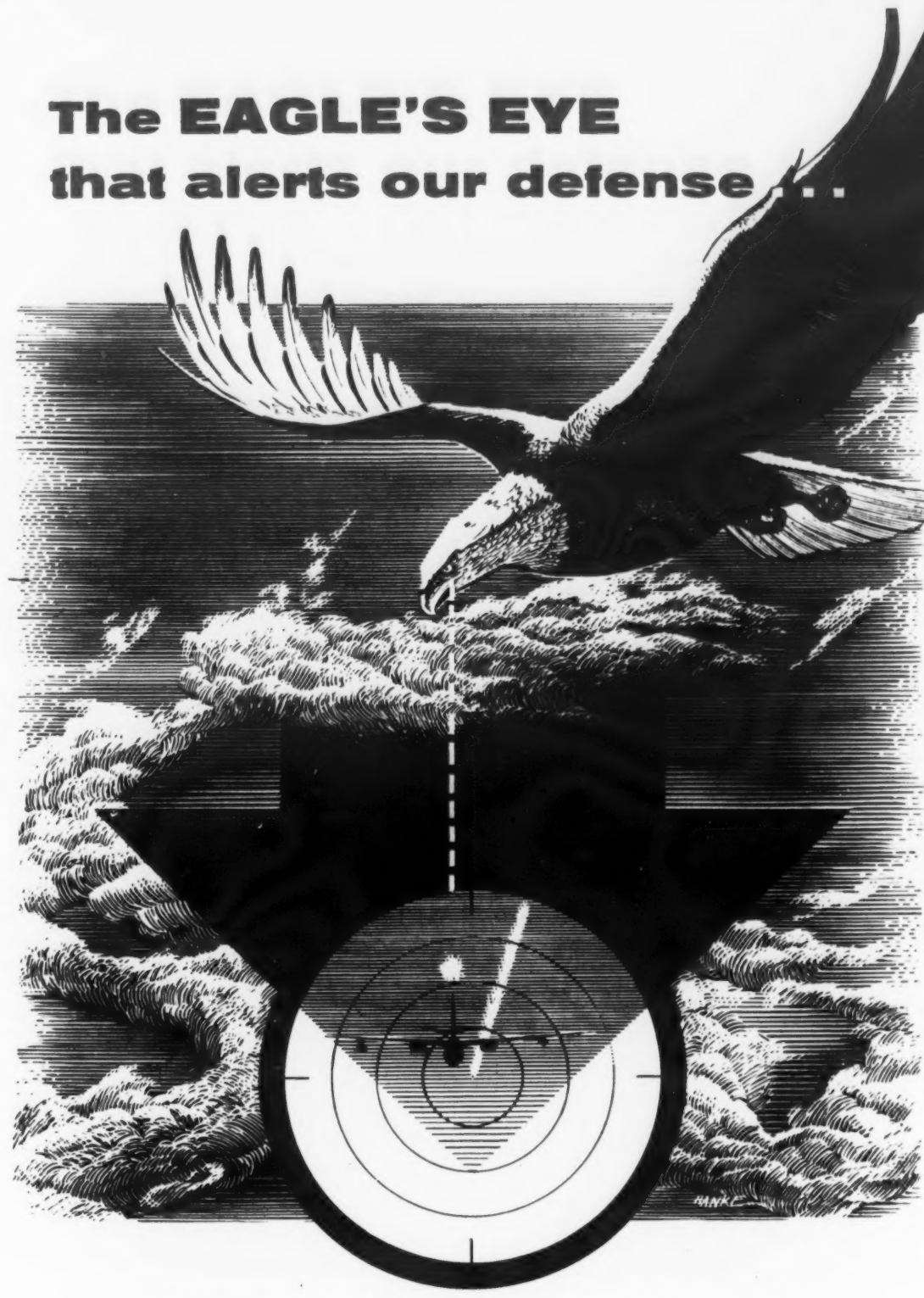
About a year ago, Raytheon announced the development of "COZI," the letters of which stand for "*CO*mmunications *Z*one *I*ndicator." This device, an unusual new type of radar, makes it possible to tell whether broadcasts on international shortwave stations or any other long-range transmitters are successfully reaching their destinations; indicates approximately how strong the broadcast signals are when they get there; and may show whether the enemy is deliberately "jamming" that particular frequency with static and interference.

Developed by the Waltham, Mass., electronics firm in cooperation with the U.S. Air Force, "COZI" has been ordered by Radio Free Europe, by Voice of America, and other long-range stations concerned with piercing the Iron Curtain with truthful news broadcasts. The Air Force plans to make extensive use of "COZI" to increase the efficiency and reliability of its worldwide communications system.

To test a signal, "COZI" sends out from the radio station's own antenna, a radar beam along the same path taken by the radio waves. The interruption in broadcasting is so brief that listeners do not notice the break. The radar beam returns and is measured for both its intensity and the time interval of its travel. From these measurements of "backscatter energy," the equipment produces values that tell the operator, with a high degree of accuracy, the "skip distance" of the wave and its probable strength when it arrives at its destination. Under certain conditions, it is also possible to detect various evidences of deliberate "jamming" through variances in the calculated energy of the backscatter return.

The greatest step forward from the age of the smoke-signal and the wigwag was when the telegraph first sped messages from point-to-point. Through the development of the telephone and the radio, with all the modernizations such as wirephoto techniques and now, television, the needs of modern communications are being met with increasing efficiency. It is reasonable to assume that microwaves and microwave devices will continue to play one of the dominant roles in communications progress.

The EAGLE'S EYE that alerts our defense . . .



From the basic electronic cathode-ray tube, developed by the vision of Dr. Allen B. Du Mont in 1931, the American Eagle has gained "eyes" of almost limitless power. Ingenious new Du Mont developments of cathode-ray tubes and circuits now supply *detection*, *sight*, and *memory* to many marvelous instruments of modern defense. And continuing Du Mont vision—serving government, industrial and broadcasting needs—will conceive or improve many more!

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Cathode-Ray Tubes, Special & JAN
Multiplier Phototubes
Test Equipment, Production Installation
Oscilloscopes & Oscillographs
Oscillograph Record Cameras
Special Electronic Test Sets
Bio-electronic Systems
Airborne Camera Control Systems
Radar Indicators, Receivers, Transmitters
Countermeasures—EGM
Trainers, Electronic Simulators
Field Test Sets & Calibrators
Navigation Equipment—VOR-DME
Radar Beacons & Radio Compass Equipment
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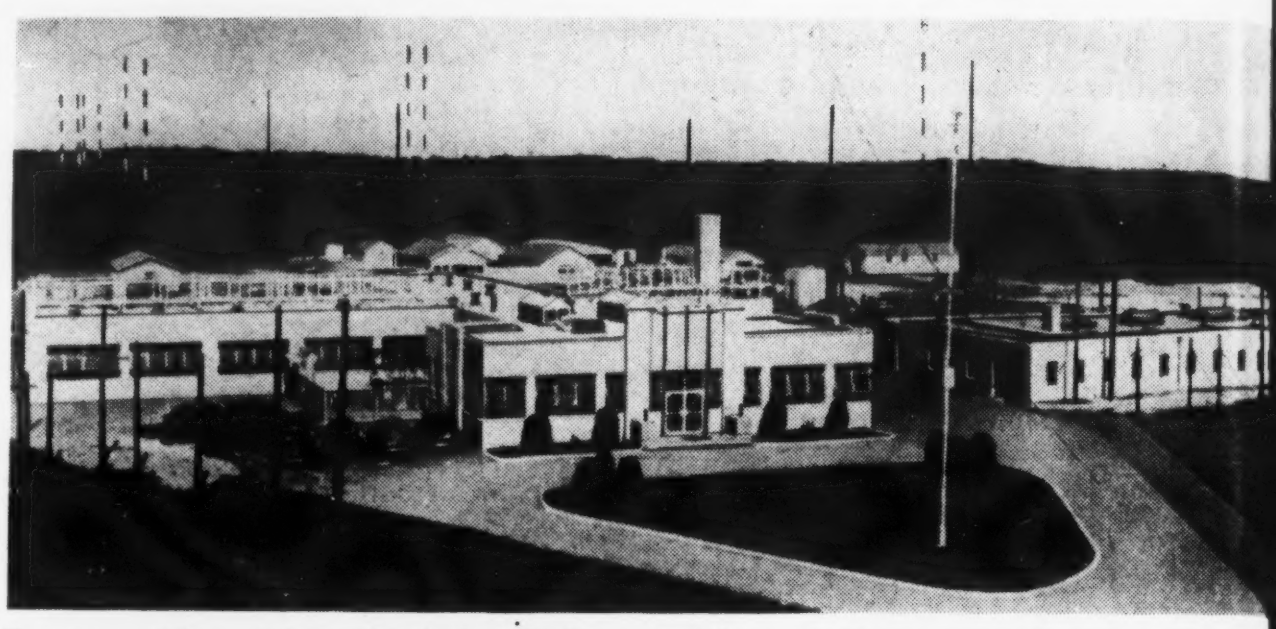


The transmitting station of Mackay Radio and Telegraph Company at Brentwood, Long Island, New York.

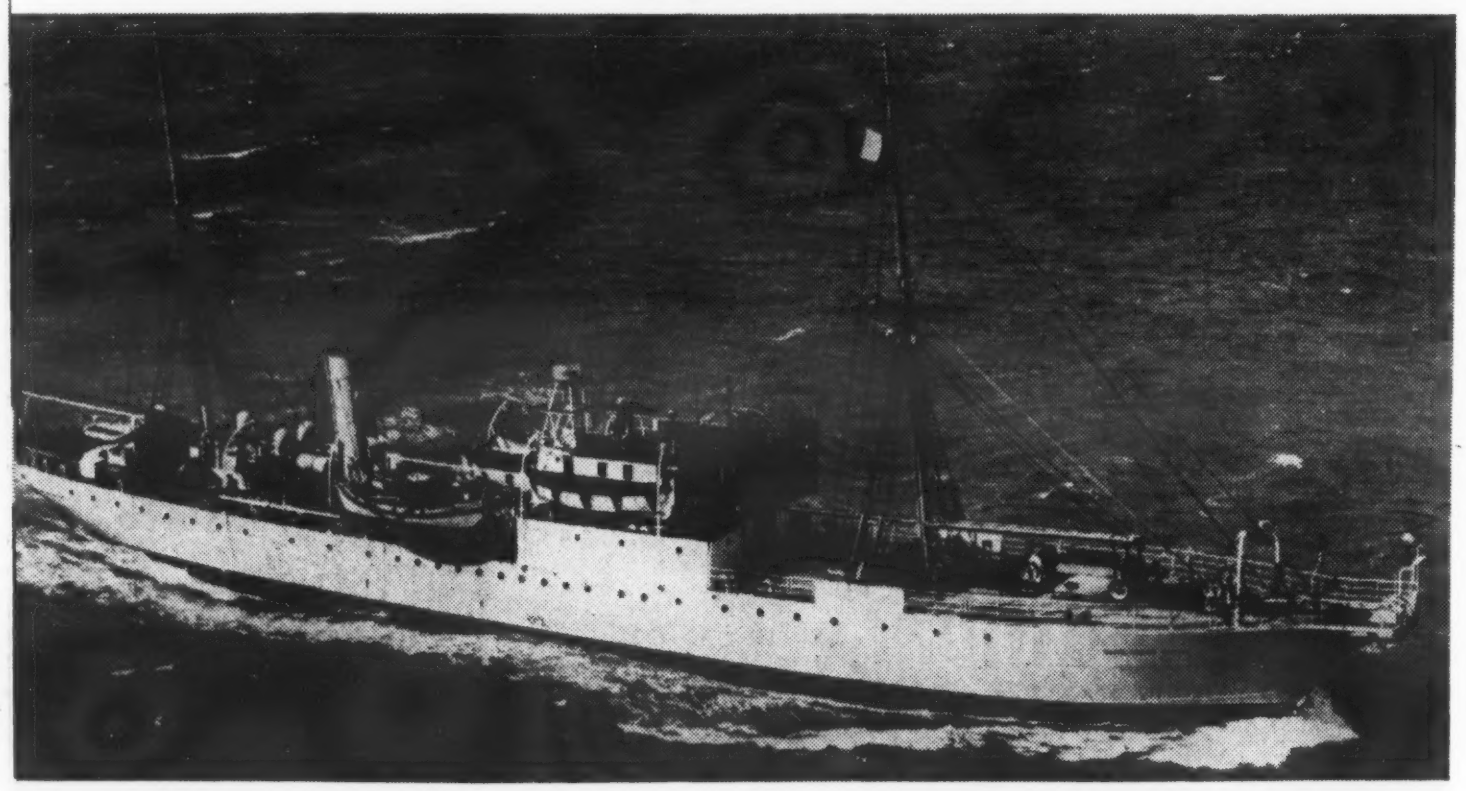
As an international communications enterprise, the American Cable & Radio Corporation is unique. With facilities that include over 70 international radiotelegraph circuits, 47,000 nautical miles of submarine cable, and more than 7,000 miles of landline, this associate of the International Telephone and Telegraph Corporation operates the only company in the United States that offers rapid and reliable communication by both cable and radio to all parts of the world.

This unparalleled combination of cable and radio service is made possible through AC&R's operating subsidiaries: All America Cables and Radio, Inc.; The Commercial Cable Company; and Mackay Radio and Telegraph Company in the United States, and Sociedad Anonima Radio Argentina in the Argentine.

All America, through its predecessors, the Mexican Telegraph Company and the Central and South American Telegraph Company — founded in 1878 and 1879, respectively—was the first U.S. company to link the Americas by telegraph.

Today, All America operates both radio and submarine cable telegraph circuits directly connecting the United States with the countries of Central and South America and the West Indies. It maintains 96 company-owned and -operated traffic and branch offices in 21 countries and islands throughout Latin America, and can effect message delivery through its own facilities to all of these locations. From Lima in Peru and Bogota in Colombia, as well as from other South American points, the company operates some 25 radiotelegraph circuits linking many South American countries with one another, the United States, Europe, and the Far East. International radiotelephone circuits are also operated by All America from several South American countries.

The cableship Marie Louise Mackay, one of three operated by the AC&R system for cable laying and repair operations.



The Commercial Cable Company has provided transatlantic cable service for more than 70 years. It links the United States, Canada, and Newfoundland directly with the Irish Republic, the United Kingdom, France, Belgium, the Netherlands, and the Azores, and with other points in Europe, the Middle East, and Africa through connecting lines.

Commercial Cable maintains 28 offices of its own in the United Kingdom, Ireland, France, Belgium, and Holland.

To keep its vital cable lines operating at top efficiency, AC&R owns and operates three cable ships: the *All America*, the *Marie Louise Mackay*, and the *John W. Mackay*—second largest cable ship in the world.

Sociedad Anonima Radio Argentina (Radiar), a wholly-owned AC&R subsidiary, provides radiotelegraph service from the Argentine to the United States and certain South American and European countries. The service between Buenos Aires and New York via Radiar also supplements other of the company's cable and radio routes to South America.

Beginning with domestic radiotelegraph circuits on the Pacific Coast in 1911, Mackay Radio's predecessor, the Federal Telegraph Company, became the first American company to establish a successful transoceanic radiotelegraph circuit when, on July 28, 1912, newspaper dispatches were

(*Continued on page* 58, *col.* 3)

Now I know how King John V felt!

I've had it in mind for a long while . . . to give something to our church as a memorial for my son. He didn't come back from Korea.

Among all the ideas that came up, several people suggested a carillon installation. I usually answered—who's got that much money? Oh, I knew about the Bok Tower, and that John V gave the beautiful bells at Mafra to the people of Portugal. But I'm just a fairly well-to-do businessman, not a king or a millionaire.

Then our pastor, seeing that I was really serious, introduced me to a sales representative who'd been calling on him. That's the way I learned about *electronic* carillons.

Using tiny bars of metal in place of half-ton bells, a keyboard any pianist or organist can play, and amplifying equipment of the sort used in public buildings, Stromberg-Carlson designed for us an installation which, except for weight and cost, is the equivalent of 38 huge cast bells! They even added an automatic attachment that starts and stops special music at any pre-set time of day.

Our church now has the finest bell music in the county—no wonder I feel like a king. One difference—my bill was well under three thousand dollars!

The same sort of engineering ingenuity which makes an electronic carillon so good and so inexpensive has also won approval, from the armed services, for many other Stromberg-Carlson products of more serious purpose. We sincerely hope we may continue to merit your confidence.

There is nothing finer than a

Stromberg-Carlson® Rochester 3, New York

STROMBERG-CARLSON LEADS TOO IN:

Telephones and Central Office XY® Dial Equipment

"Panoramic Vision" Television Receivers

Radios and High Fidelity Radio-Phonographs

Sound and Public Address Systems

Office Intercom Equipment

A bullet sang through her sleeve

AFTER THE BATTLE of Spotsylvania, she wrote, "I have cooked ten dozen eggs, made cracker toast, blanc mange, milk punch, arrow-root, washed hands and faces, put ice on hot heads, written six soldiers' letters home, stood beside three death beds . . . It has been a long day . . ."

But no longer than the day at Antietam, where as Blue and Gray fought to the death, a bullet sang through her sleeve and killed the wounded soldier she was caring for.

Or Fredericksburg, where a shell fragment tore her clothing but could not frighten her from working while the battle raged.

It is not surprising that this slender determined woman later founded the American Red Cross almost singlehanded. For Clara Barton had become an artist and expert at meeting grim disaster.

Like Clara Barton, today's Americans still meet trouble with skill and resolution. For qualities that made her great still live in the American people. And the fact that these people are the real guarantee standing behind our country's Savings Bonds tells you why U.S. Savings Bonds rank among the world's finest investments.

Why not join the millions of your fellow citizens who are now guarding their futures —and their country's—by investing in, *and holding*, U.S. Savings Bonds? Start today!

It's actually easy to save money—when you buy United States Series E Savings Bonds through the automatic Payroll Savings Plan where you work! You just sign an application at your pay office; after that your saving is done *for* you. And the Bonds you receive will pay you interest at the rate of 3% per year, compounded semiannually, for as long as 19 years and 8 months if you wish! Sign up today! Or, if you're self-employed, invest in Bonds regularly where you bank.

Safe as America — U.S. Savings Bonds

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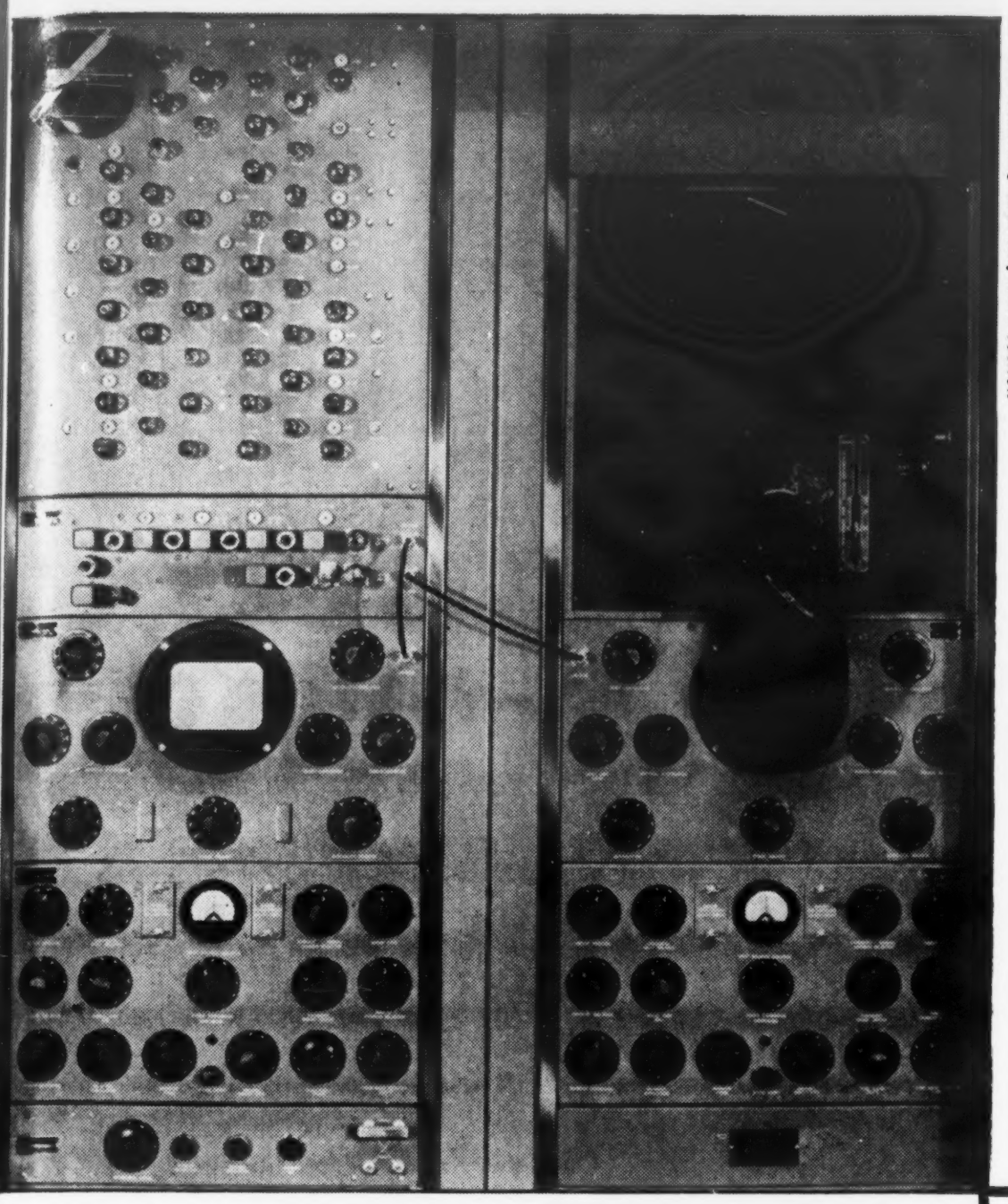


500 mc recording receiver, front section

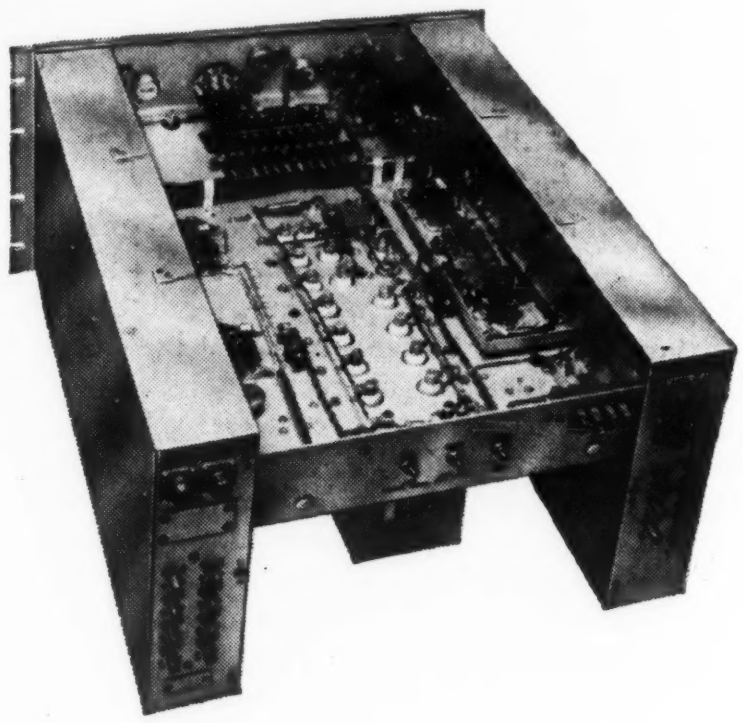
Solutions Unlimited

During its thirty-two years, Radio Engineering Laboratories has received world-wide acclaim for superior designs and production of dependable radio equipment. REL gear is continuing to achieve outstanding performance in these and other current applications:

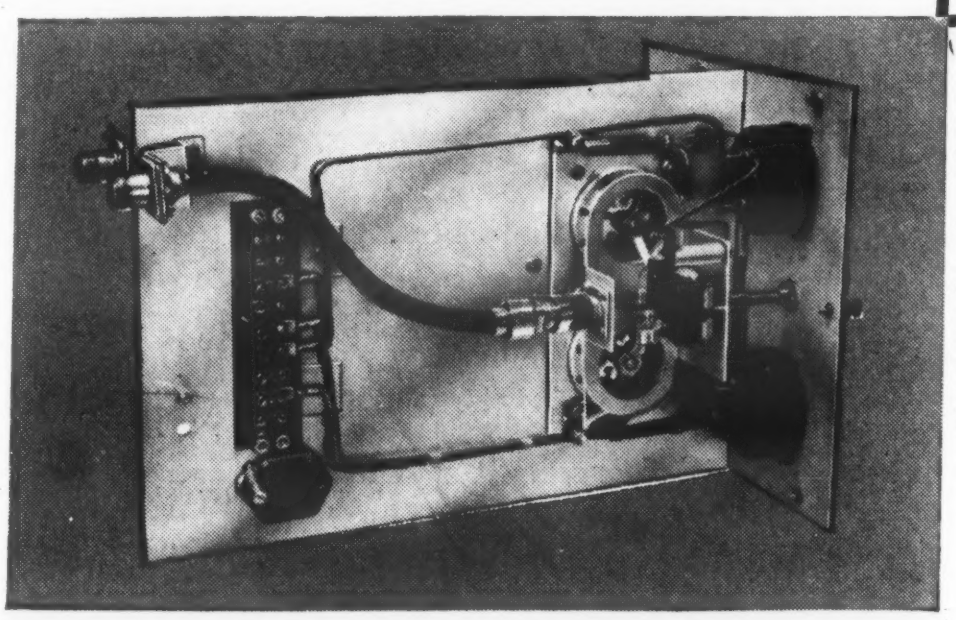
Thin route telephone toll service
Guided missile control
Wave propagation research
Point-to-point communications (long and short range)

Radio frequency bands: 50 to 1500 mc
Output powers: 2 watts to 10 kw
Modulation base bands: .20 kc to .5 mc
Receiver noise factors: 3 to 7 db

Your specialized radio problems are invited; REL has the experience and facilities to solve them.



Sweep generator, bottom view



150 mc output amplifier, bottom view

REL

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Canadian representative:
Ahearn & Soper Co., P. O. Box 715, Ottawa

International representative:
Rocke International Corp., 13 E. 40, N.Y. C.17

Dispersal is More than Defense Against Disaster

by Oliver J. Greenway
Vice President, International Resistance Company
Philadelphia, Pa.

EVERY WORKING DAY, INTERNATIONAL RESISTANCE Company and its overseas licensees turn out more than 4,000,000 resistors, chokes, potentiometers and other components vital to the manufacture and maintenance of all sorts of electronic equipment, civilian and military.

Should disaster strike—and that includes fire and other hazards of peacetime operation as well as the destruction that is inherent in another global war—IRC and its associated companies could still go on producing enough of the required quantities of resistors and other components to meet foreseeable demands.

It is possible to say this because as long as 20 years ago, IRC began a program of licensing production of its products in other countries. Six years ago the company began a long-range decentralization program in the United States to achieve greater operating efficiency dovetailing with the dispersal program being urged on business by the Office of Defense Mobilization and the U. S. Department of Commerce.

Terminal Commerce Building, Philadelphia, Pa., where IRC occupies 230,000 square feet, is only one address of this 30-year-old company that is the outgrowth of a research experiment dating back to the infant years of commercial radio. Asheville, North Carolina, is another IRC plant-city. Downington, Pa., is a third. Boone, N. C., is yet another. Other IRC associates operate in California and Florida.

There are others, too. IRC has licensed companies in Australia, Canada, Denmark, Italy and Great Britain for the manufacture of its products.

In fact, should disaster strike, IRC is ready to set up shop at other locations. For example, *hidden away in an area more than 50 miles beyond the company's Philadelphia headquarters is a complete plant in "mothballs"*, ready for operation, because the Armed Forces insist on keeping certain IRC components flowing at a never-ending pace. This plant could be staffed and in production on short notice.

Key executives and personnel for this "shadow plant" —owned outright by the United States Government, but put together by IRC before being cocooned—would converge on D-Day from Philadelphia and other U. S. locations, and if necessary from Toronto, and within a few days from other countries if events dictated.

In other words, IRC is prepared against disaster in the United States and over the globe, whether that disaster strikes in peace or war. In a world of tensions between nations and in business economics and operations as well. it is possible that the story of IRC's decentralization-and-dispersal program may have special meaning for business managements confronted with this problem.

When the United States entered World War II, the company was swamped with orders. This resulted in an increase of the working force from about 500 employees in 1941 to more than 4,000 in 1944. In addition to its main plant the company found it advantageous to operate in both Canada and England.

Toward the close of the war, IRC took its first step in its combined decentralization-and-dispersal program. The Canadian company was sold, and it thereupon became an IRC licensee. It was then that we decided to plan the company's future growth, too. As a consequence, the ODM dispersal idea has never been the dilemma for this company that has been for some others.

When events in Korea brought about government emphasis on the need for industry to disperse, IRC was ready to move—and it has been carrying out its master plan for expansion hand in hand with its plan for dispersal ever since. Our readiness was founded on management's conviction that our divisions operate most efficiently when a divisional ceiling of, say 500 employees, is observed, and when division autonomy is confirmed by geographical separation.

We came to these basic decisions in 1949. Our first move was to set up our own plant for the manufacture of chemicals we were buying from outside suppliers, and in 1950 we established this specialized operation in Downingtown, 35 miles west of Philadelphia. By making there the compounds that are key materials in resistors, we also were able to institute a much better quality control system as well.

With the outbreak of hostilities in Korea, the "shadow plant" more than 50 miles from Philadelphia was set up, tested, and then put in mothballs—a facility complete in every respect including machinery, office supplies, and everything else that would be required for immediate operation.

Our next expansion move was southward. We had determined to set up our potentiometer division as an autonomous operation doing a volume business, and a team was sent out to locate a site that met all specifications, particularly with regard to being a lot more than 10 miles from the Philadelphia Industrial complex.

The location we wanted was found in the vicinity of Asheville, N. C. There, in a modern fireproof, steel, concrete and brick building having 35,000 square feet of floor space, we started producing quality controls in March, 1953. Today, that plant has a few more than 200 people on its payroll and is showing steady growth within the bounds that we previously had planned for it.

Our third combination expansion-decentralization move came in the same year. We purchased the Gorman Manufacturing Corporation's plant and resistor manufacturing facilities in Los Angeles, installed some of our own equipment, and thereby kept shipping costs down for our West Coast customers and established closer operating and service relations with the California aircraft industry which uses so many of our specialized products. The Los Angeles force is relatively small—fewer than 50 employees—but there is a blueprint for growth.

Company expansion plans, increased demand for our components, and agreement with the dispersal idea dictated the next move. We decided to put all of our production of power wirewound resistors and a number of precision, high voltage, high frequency and special resistors under one roof—away from Philadelphia. In January, 1954, this autonomous division went into operation in a steel, concrete and brick building of 36,000 square feet in Boone, N. C. This plant makes a number of essential components to fill military orders. The payroll is moving up toward 200, at a pace in keeping with our overall plan.

Each Plant Autonomous

We have expanded since then into Florida, too, on some hush-hush work. And wherever we go in the United States or abroad in close working co-operation with our licensees, our objective is to produce complete components with small, efficient work-teams that know what they are doing, where they are going, and how each team and each division fits into the company's scheme of things, national and international.

Of course, there is more to the IRC master plan than merely spotting specialized manufacturing plants and licensees over the map. The combination expansion-decentralization-dispersal program has brought about a number of other developments, among which may be cited:

1. Blueprints, formulas, records, contracts, accounting systems, patent information, engineers' notebooks, photographs of all machines, historical and operational data and documents, names of suppliers, insurance information, etc., are microfilmed in specific numbers of copies.
2. Microfilm copies are deposited in fireproof safes at all plants, and safe combinations known only to company directors and executives are also locked in safe deposit boxes in banks in a number of towns well away from the plant sites themselves.
3. Payroll information sent on Monday from each plant to Philadelphia is key-punched and transferred to IBM recording systems, and every pay-day, the tape, put through a transmitter in Philadelphia, fills in names and amounts on pre-signed paychecks fed into the wire receiver at each distant plant.
4. Wherever IRC has installed a new plant, the company becomes an honest-to-goodness member of the community. We select our local employment manager from that community, and as a rule he knows the people we should and do employ. Except for top management, few outsiders from our other plants are sent to the new plant on a permanent basis, as it is the company's policy to employ local people as far as possible.

This last-listed point has its own special dividends. Late one Saturday afternoon, a few days before our plant in Boone, North Carolina, was to begin operating, I visited the plant and found the lawn around it being watered by someone obviously not on our maintenance roster. He turned out to be the president of the Boone Chamber of Commerce. He didn't stop at helping to bring a new industry to Boone; he wanted the newcomers to know they were fully appreciated.

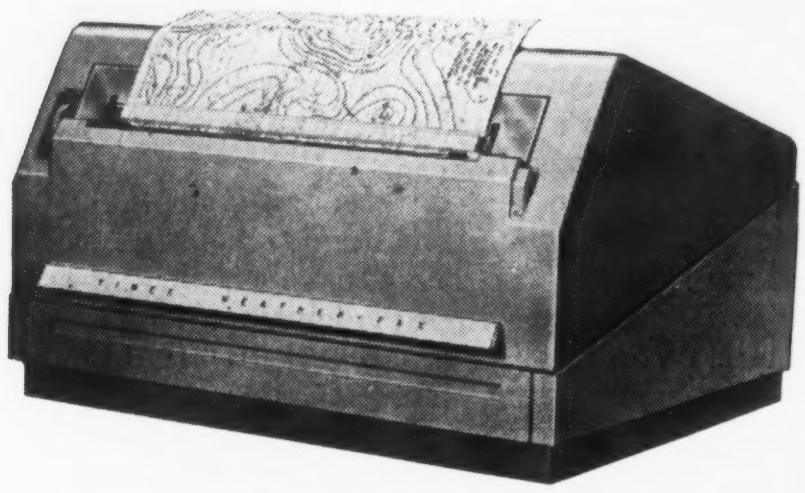
Security of Jobs and Investments

Businesswise, how has IRC's decentralization-dispersal program turned out? The answer to this question may be summarized as follows:

1. Every division is now a profitable autonomous operation, with its own expansion program.
2. Every plant has specific goals, excellent internal communication, and fine management-employee relations.
3. Because IRC is a working corporate citizen in every community where it operates, company morale and pride, and community understanding and respect, are high.
4. IRC has done everything possible to protect its business against the ordinary misfortunes of peacetime operation, thereby increasing the security of jobs and investments.
5. The company has done more than make a gesture of co-operation with the United States Government. As the world's largest manufacturer of a complete line of resistors, IRC has complied completely with the Office of Defense Mobilization's determination that American industry must be ready should the defense situation require production under emergency conditions.

This has been accomplished without government prodding. It may honestly be said that IRC's management planned it this way, and has proved that it is profitable.

Because our plans worked out, because today we are a better, more efficient, more productive company than we ever have been. International Resistance Company here testifies that dispersal is more than defense against disaster—it is good business, and good business insurance.



A continuous facsimile recorder used to receive 18-inch weather maps.

Visual Communication by Times Facsimile

TIMES FACSIMILE CORPORATION has pioneered in the "new" type of world communications, communications in graphic or pictorial form. While the facsimile art is over 100 years old, there is still much pioneering work to be done both in domestic and world wide communications.

In 1940 many pictures were transmitted from the Antarctic and received on Times Facsimile equipment. A series of experimental tests were made between New York and Fairbanks, Alaska in 1941. The designs for equipment which was used extensively throughout the world during the war by the Office of War Information grew out of these tests.

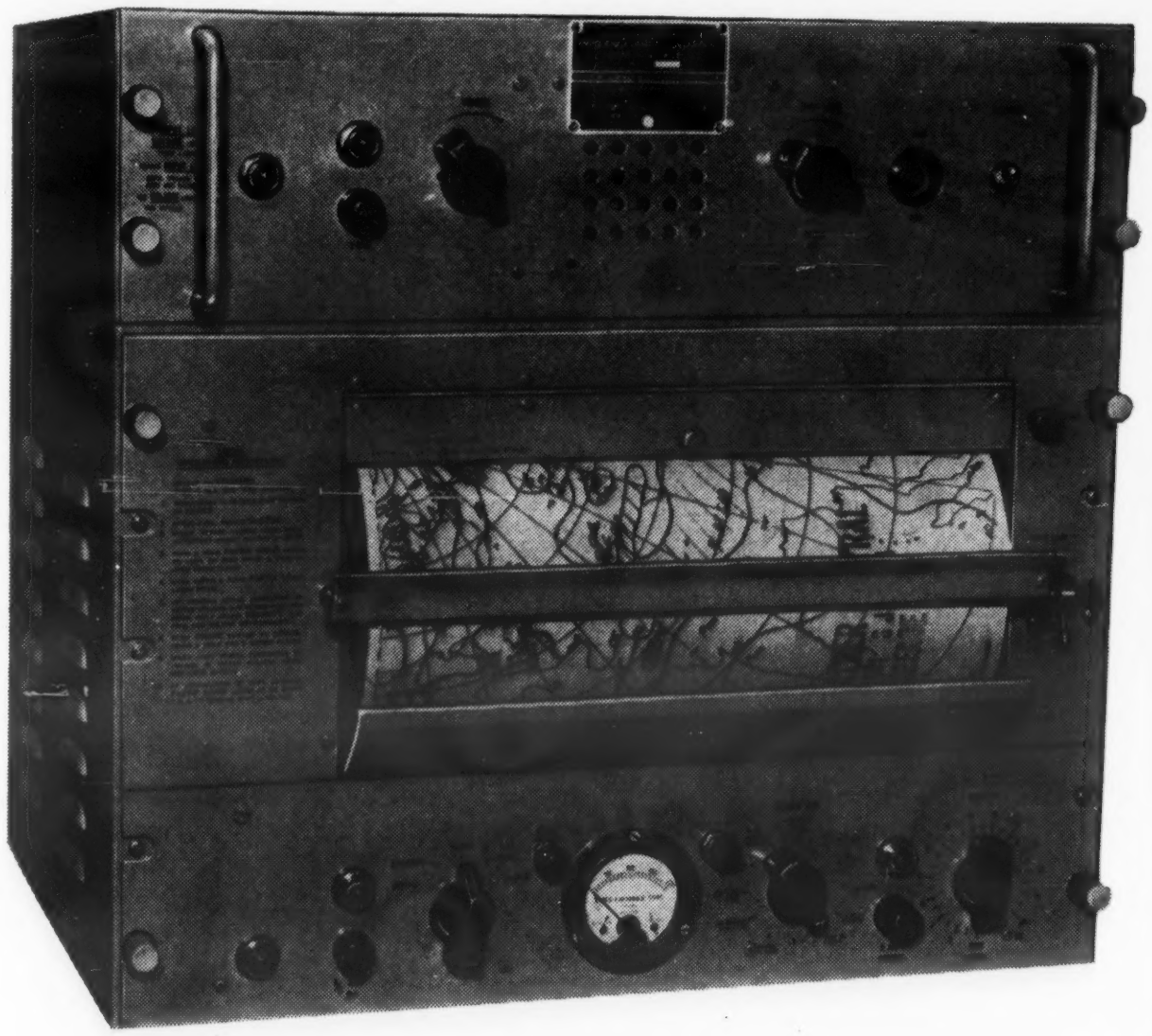
The romance of facsimile was highlighted by an installation during the war in a cave in Kunming, China. The equipment arrived over Kunming in a plane with a disabled landing gear. The entire cargo including the facsimile transmitter was jettisoned at an altitude of 100 feet and landed in a rice paddy. The damage consisted of a broken casting and a bent leadscrew which were repaired by an OWI engineer before replacement parts arrived from the U. S.

The success of weather map transmissions in the European Theater resulted in the establishment of a weather facsimile network which supplies service to several hundred airfields and meteorological offices in the U. S. and overseas. The service is broadcast to ships at sea and several foreign countries.

Other facsimile networks operating on Times Facsimile equipment have been established in South America, Belgium and South Africa.

The Navy is equipping a large percentage of their ships with facsimile to meet the requirements of meteorological operations, pictorial services and message communications.

Facsimile recorder of the type commonly used aboard Navy vessels.



1 Shell leaves enemy mortar, headed for U.N. lines.
2 Radar detects shell in flight, automatically tracks course, sends data to recorder
3 Recorder translates data, enables operator to pinpoint position of enemy mortar.
4 With exact position known, U.N. howitzers destroy enemy mortar by accurate return fire.

ENEMIES' MORTARS LOCATED BY RADAR

Army Used Device Against Reds in Korea, NY TIMES, DEC. 12, 1954

THE STORY BEHIND THE STORY:

■ "Hundreds of soldiers now returned safely from Korea literally owe their lives to the extreme accuracy and speed of the new counter-mortar system." This good news was revealed by the Signal Corps in December when the public first learned of the existence of the MPQ-10 Mortar Locator, one of the Army's best kept secrets.

■ How could a carefully concealed enemy mortar be located and destroyed after just one or two shells had been fired? And how could such devastating accuracy be repeated over and over again—no matter how often the enemy relocated his mortars? These were important questions in Korea.

■ Actually, the uncanny efficiency of the MPQ-10 Mortar Locator was due to the joint efforts of the Army Signal Corps and Sperry engineers. Working together, they developed a new portable radar system for use at the front lines. How does it work? An automatic radar tracker detects and "locks on" the path of enemy mortar shells. In effect, it traces each shell back through its trajectory and reveals the enemy position. This information is then relayed to an artillery fire direction center which directs a return barrage against the enemy mortar in a matter of minutes.

■ Delivering this Mortar Locator to the troops is another example of Sperry engineering and production solving a problem to meet a critical need. Today, in the air, at sea, as well as on land, Sperry is helping extend our nation's capabilities with instruments, controls and systems for all branches of the military as well as for important segments of industry.

SPERRY GYROSCOPE COMPANY

DIVISION OF THE SPERRY CORPORATION • GREAT NECK, N. Y.

Stewart-Warner dedicates itself to Military Electronics

OPERATING IN AN EXPANDING AND HIGHLY COMPETITIVE industry, in a period when research and development often strained both production capacity and ability, Stewart-Warner Electric has come to the front in the past decade as a specialist in several complex categories of military electronics.

This pioneer producer of radio devices is presently completing conversion of its entire plant facilities in Chicago to production of these more intricate types of electronic products. For, at the end of 1954, it announced that it had discontinued its domestic radio and television set business, begun in 1923. The announcement stated that "this decision has been influenced greatly by the heavy load of electronics development and production work which we have undertaken for the United States government, since such work requires the complete utilization of all of our physical facilities and technical personnel."

Such "dedication" to the more publicly obscure side of electronics—by a company which for over 30 years had enjoyed world-wide public recognition as a designer and manufacturer first of home and car radio sets and subsequently of television sets—naturally evoked many questions.

To military procurement people, and to other companies in the electronics industry, however, the announcement brought nary a riffle. To them, for upwards of fifteen years, Stewart-Warner had been accepted as an organization capable of resolving some of the more intricate design and production problems of communications, countermeasures, pulse radar systems, air traffic and navigational controls or aids, and, more recently, the electronic equipment for guided missiles.

Comments E. G. Fossum, general manager of Stewart-Warner Electric:

"Our constant aim has been a highly integrated operation. Our research and development personnel work under the same roof with our production people. When something new is ready for production, or a modification is decided upon, the production people are ready and able to roll fast."

A welcome and gratifying side effect of the decision to drop home radio and television was the immediate strengthening of the engineering group available to work on research and development jobs, according to Mr. Fossum. Where formerly it was necessary to staff and maintain two engineering groups, all technical people were integrated into one.

The pattern of operating organization is of the type not uncommon to the electronics industry—a project group system. A project engineer who has full responsibility for fulfilling all of the engineering requirements of a contract is responsible for a group which consists of the necessary electronics engineers, laboratory technicians, mechanical engineers and designers, engineering mechanics, draftsmen and clerical personnel. There are twelve such distinct groups presently working on military requirements.

Testing chamber for electronic equipment at Stewart-Warner.

To serve the project groups in various capacities there are three separate groups described as follows:

Components Approval and Specification. This group is responsible for all quality control on new components; it assists the project groups in the completion of final specifications covering new components.

R. F. Cavity, Waveguide and Antenna Group. This group specializes in the design and development of transmitter and receiver cavities, waveguides and antennas; it furnishes these items to the project groups.

Field Engineering Group. This group assists the project groups in field tests and furnishes field service when it is required. A field service group has been set up to assist the customer in field problems in integrating equipment into their present requirements or systems. These men are available at all times to customers, to assist in resolving all types of electronics problems.

Stewart-Warner Electric's entry into government electronics dates back to the beginning of World War II. It quickly gained recognition as a specialist in communications equipment, and it is the understanding of management that the company was the largest single supplier of such equipment during that period.

Various well-known models of communications equipment developed and/or produced during or since the War by Stewart-Warner include the Model ATC transmitter; Model AN/ART-13 transmitter; Model TCS transmitter receiver; Models YG-1 and YG-2 homing beacons, and Model SCR-290 FM transceiver. The most recently produced communications equipment for the Signal Corps includes automatic pre-set tuning transceivers covering the frequency range of from 0.5 MC to 30 MC, and 50 MC to 60 MC (RT-70 and GRC-19).

Generally, in the several fields which have benefited from Stewart-Warner Electric's development achievements, the accomplishments have concerned those operational or functional elements which, in themselves, represent the "heart of the package." Advanced design in such cases can make the difference between elevated performance levels for the complete equipment and mere duplication of previous achievement.

Elements which have been advanced in design include such factors as receiver and transmitter cavities; subminiaturized lamp constant type high fidelity delay lines having multi-tap outputs with close spacing tolerance; electronic delay lines; effective pressurization for high altitude operation; high efficiency heat dissipation and cooling techniques; light weight, high density construction to resist extreme vibration.

Navigation and countermeasures equipment has been advanced in the development of automatic direction finder; this device, covering a frequency range from 250 KC to 30.0 MC, provides instantaneous true and relative bearing indication and panoramic indications on a cathode tube.

Laboratory and Test Facilities

Comprehensive environmental test equipment for heat, cold, humidity, altitude and vibration testing—to test and confirm the ability of products to perform satisfactorily under the most rigorous operating conditions—is maintained. It is possible to simulate weather conditions found anywhere on the face of the earth, from the polar ice caps to the heat of the equator, and from sea level to twenty miles in the sky, imposing on equipment under test the most vigorous of vibration conditions.

In addition to environmental test equipment, the complement of engineering test equipment includes R. F. interference equipment; signal generators; pulse counters; oscilloscopes; microwave test equipment; meters and bridges, and a wide variety of miscellaneous equipment such as cameras, decade resistance boxes, potentiometers, distortion analyzers and variable frequency power supply units of, for example, 3 KW capacity 28v. DC, with frequency range from 25 to 5,000 cycles. In addition, a model shop containing milling machines, lathes, drill presses, shears, presses and saws is maintained to build experimental versions of all products.

New Approach to Electronic Component Assembly

Stewart-Warner's research engineers are engaged in a Mechanical Assembly Technique program directed toward the extension of the "state-of-the-art." Efforts expended to date have established the feasibility and practicability of a mechanized assembly of electronic components into sub-assemblies without the use of solder or any other molecular bonding agent, and without the use of insulated interconnecting wires.

This system (known as MAT) mechanically assembles standard components into useful miniature and subminiature circuitry contained in small vapor-sealed cannisters. Each cannister supports its circuit components

A project group at Stewart-Warner studies an engineering problem. These groups work together in development of military equipment.

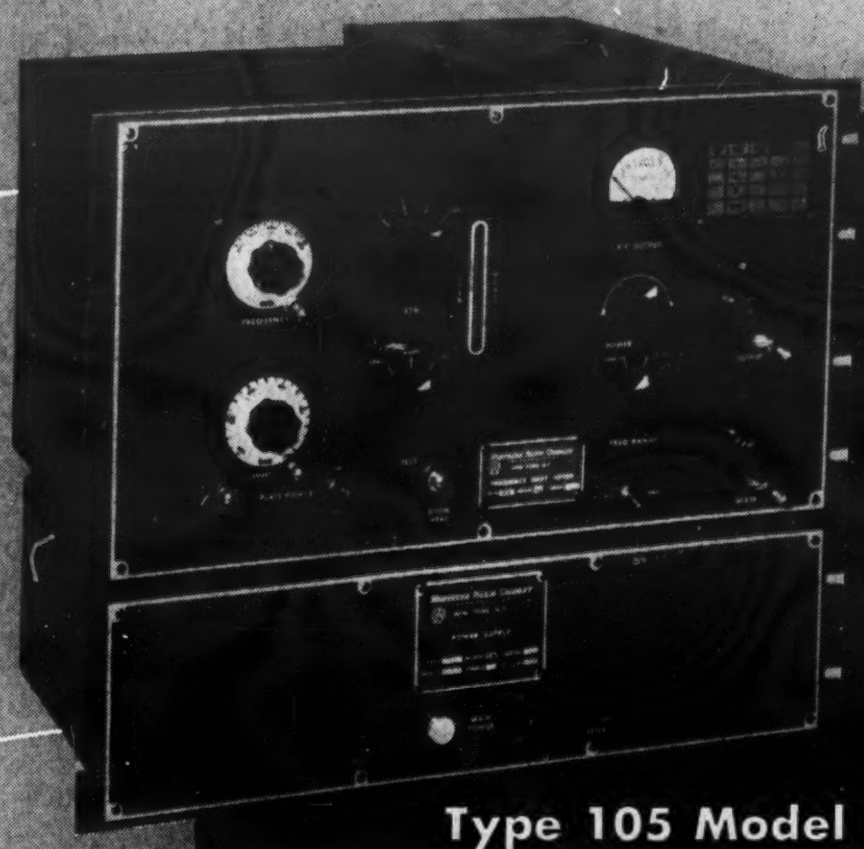
independently of the individual leads. It also redistributes the generated temperature of components over substantially greater heat transfer surface, thus reducing the operating temperature of the entire circuit and increasing its tolerance to elevated ambient temperatures.

Each machine-produced cannister and circuit board is tested as an assembly, resulting in a matched components effect and the highest possible reliability factor.

Because MAT is based on a highly reliable pressure-contract principle including mechanically produced connectors, equipment which incorporates MATized circuitry is extremely simple to service in the field. Each cannister of circuitry may be easily and quickly removed and replaced. Entire equipment replacement is never necessary. And, the level of skill necessary to service MAT is greatly reduced, since it is easily pressure-connected after indexed mechanical assembly.

Comparatively low cost of MAT construction makes it attractive from several standpoints. In the event of extremely urgent high volume production, MAT machines can be calibrated to produce required circuitry in high volume, relieving the almost certain shortage of hands necessary to produce equipment using conventional methods. When high volume production is not required, MAT's high reliability factor make it very attractive for the many applications where great reliability is extremely important.

YEARS AHEAD of the industry...



Type 105 Model 6

New! Northern Radio

FREQUENCY SHIFT KEYER

Sets a new standard for the Industry. It supersedes and directly replaces its LEADER PREDECESSOR, the Type 105 Model 4.

New! *Highest Stability achieved by any Frequency Shift Keyer*

New! *Increased Frequency Range 1.0 to 7.0 mc*

New! *Pre-selection of Proper Frequency Shift for any particular transmitter frequency multiplication*

New! *Permits use with external oscillator without need of adapters*

New! *Improved Accessibility — for even easier maintenance*

The new Northern Radio Frequency Shift Keyer Type 105 Model 6, is a very high stability RF oscillator which provides a means for shifting an RF carrier in accordance with the intelligence. This exciter replaces the crystal oscillator in a transmitter and produces "Mark" and "Space" carrier shift for transmission of teleprinter or telegraph signals, or a linear carrier shift for transmission of FM telephone, facsimile or telephoto. In addition to the technical advancements mentioned above, this new Keyer continues to embody the following performance-proven features:

- Direct-reading frequency calibration of shift from 0 to 1000 cps.
- Frequency shift dial adjusts "Mark" and "Space" frequencies equally above and below the carrier position, which remains fixed.
- Simplfied frequency setting makes only the upper sideband tuning indication visible on the meter over substantially all of the tuning range.
- Direct-reading frequency calibration of mixer and output tuning dials from 1.0 to 7.0 mc.
- Direct-reading calibration of output frequency vernier ± 600 cps.
- Pulse-shaping circuit to permit operation within assigned bandwidth with no adjacent channel radiation.
- Highly stable temperature-controlled oven with control of ± 0.1°C. at 60°
- Linear carrier shift up to 1400 cps for Fax operations.
- Component ratings according to JAN specs for greater assurance of trouble-free operation.

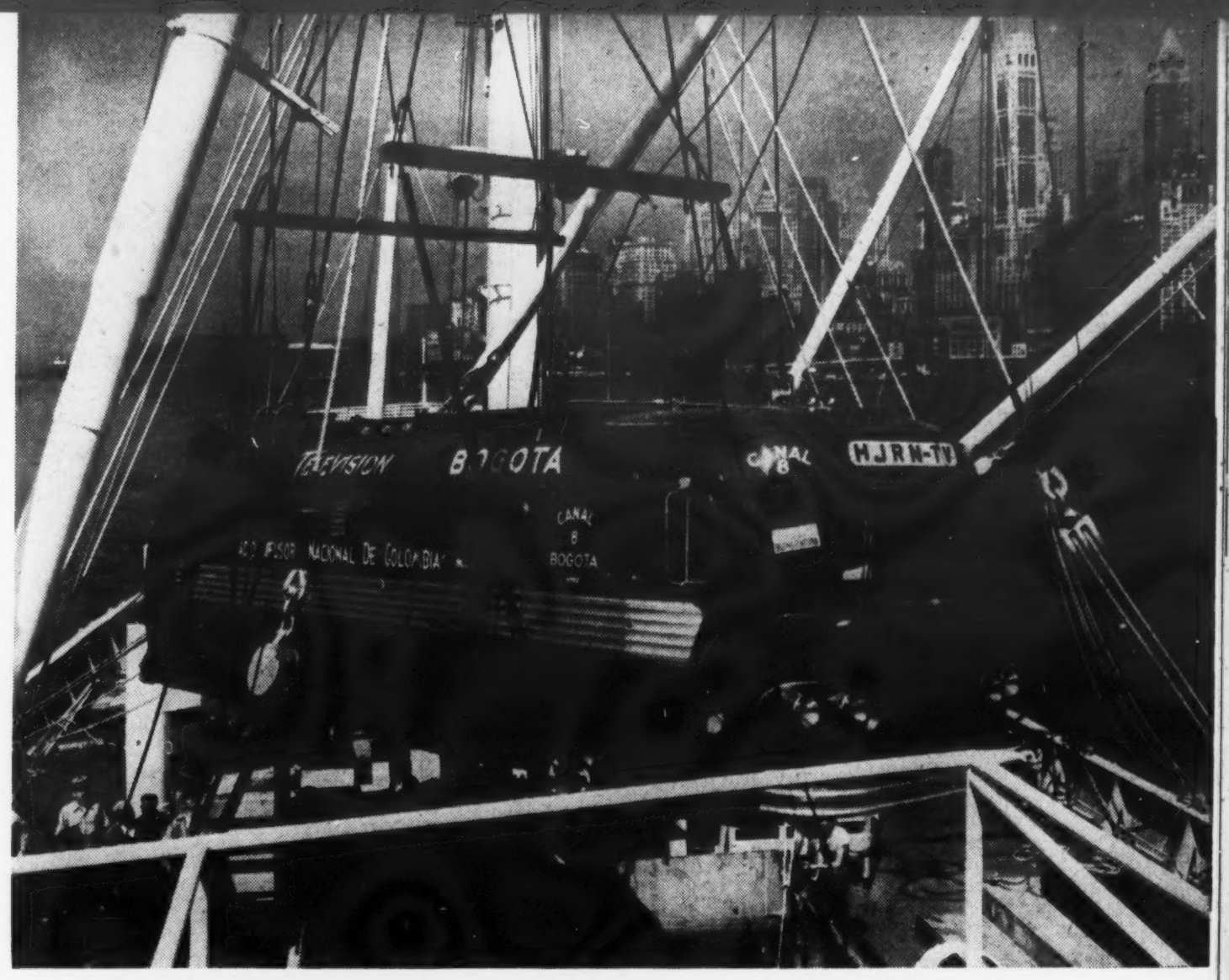
Pace-Setters in Quality Communication Equipment

NORTHERN RADIO COMPANY, inc.

147 WEST 22nd ST., NEW YORK 11, NEW YORK

In Canada: Northern Radio Mfg. Co., Ltd., 1950 Bank St., Billings Bridge, Ottawa, Ontario.

Write for Free Catalog S-5



Part of the television equipment shipped to Bogota, Colombia, S. A. by Du Mont International was this Du Mont "Telecruiser," a television vehicle for remote broadcasts. Station HJRN-TV is the first television station in that country.

Du Mont around the world

ALLEN B. DU MONT LABORATORIES, Inc. of New Jersey, celebrates its Silver Anniversary next year. In the 24 years of its existence it has grown from a small basement laboratory in Upper Montclair, New Jersey, to a corporation with 5000 employees and 13,000 stockholders.

The first commercial cathode-ray tube was produced in these laboratories. Today Du Mont television receivers are produced in massive quantity along one of the world's largest TV assembly lines. In addition to the manufacture of receivers and the operation of a television network, Du Mont Laboratories is involved in cathode-ray tube production, the manufacture of mobile radio equipment, oscillographs, multiplier phototubes, television transmitter equipment, TV studio apparatus and a wide variety of specialized electronic equipment for industry and government. Also, Du Mont is the largest manufacturer of specialized cathode-ray tubes in the world.

Du Mont products are found in South Africa, India, Norway, New Zealand, Iraq, Argentina, Greece and 22 other foreign countries.

The International Division of Allen B. Du Mont Laboratories, Inc., was established in March, 1952. Today it enjoys representation in 30 countries. All export sales, activities and foreign licensing arrangements for Du Mont instruments, receivers and picture tubes are carried on through this division. Licenses for television receiver manufacture were recently granted to corporations in Canada and Australia. The recent establishment of a Caribbean sales office has been helpful in developing the Du Mont Latin American operation.

The Armed Forces of the United States account for about 30% of the output of Allen B. Du Mont Laboratories, Inc. Among products produced for government use are airborne radar, shipborne radar, communications apparatus, electronic test equipment, cathode-ray tubes, cathode-ray oscillographs, electronic control apparatus used in aircraft, sonar, computer components, and numerous research and development contracts.

In the field of radar, Du Mont Laboratories recently installed a compact and highly sensitive Du Mont airborne radar set aboard a DC-6 commercial airliner of the Braniff Inter-

(*Continued on page* 58, *col.* 2)

Compact and highly sensitive Du Mont airborne radar, which can receive information from distances up to 200 miles, is undergoing exhaustive tests by Braniff International Airways. The picture below shows the radome housing in the nose for the radar antenna.

Truth—the purpose for global communications

(*Continued from page* 16)

"The 'Voice' is one of the most effective instruments of the free world in combatting the spread of Communism and in keeping alive the hopes of men and women behind the Curtain." The best experts of Soviet Russia, he reports, have installed the most modern jamming devices in a vain effort to cut off all listeners.

Other USIA Activities

Perhaps the most massive of the Agency's operations is its Press and Publication Service. The Wireless File of this service sends a daily 7000-word news bulletin to all U. S. Information Agency major posts for publication in overseas newspapers and magazines. In many countries it is the only United States news service received. In others, it is the chief source of United States news. In many of these countries in the past, TASS, the Soviet news service, was the chief United States news source.

The Press and Publication Service further provides material and logistic support for the newspapers and magazines published at the Agency's overseas posts. It supplies reprints from United States publications, special articles, news pictures, cartoons, leaflets, pamphlets. Some 10,000 publications are served.

In certain areas, the Far East, for example, the Agency's Motion Picture Service is a vital weapon in the battle of ideas. The division supplies overseas distributors (as well as private groups) with newsreels covering United States activities and documentaries supporting the Agency's mission. The films are made available in as many as 38 languages. In the first category there has been, for example, newsreel coverage of visits of foreign potentates, the Shah of Iran, the President of Haiti, Secretary Dulles' speech before the Foreign Policy Association of New York, etc. Anti-communist documentaries include such subjects as "My Latvia," a story of the Communist rape of that country; "Dance to Freedom," telling of the escape of the Hungarian ballet dancers, the Kovacs; "Let Us Live," the story of refugees from East Germany.

"Our Times," a monthly 20-minute motion picture review of events bearing on United States policies, went on regular production schedule last midsummer, and is now produced in 30 languages and distributed each month in 69 countries.

At the year's end, 157 information centers and 35 binational centers were in operation in the 79 countries served by the U. S. Information Agency. The number of persons who visited these centers during the year is estimated at 54 million.

The centers handle the Agency's book projects, including a translation program which has put 16 million United States books into circulation overseas, and the book presentation program which has placed four million books in the hands of key individuals and organizations. The Communist book projects are one of their main propaganda activities. The competition they are meeting today, however, is giving American thinking an increasingly important role in the battle for men's minds.

The U. S. Information Agency's television program is operated by the "Voice" in cooperation with the Motion Picture Division. It is, of course, limited to the number of overseas television stations in operation at present. 29 stations in 21 countries receive kinescopes, newsreels and other films each week by air.

All communication techniques are called into play for special projects such as, for example, the publicizing of President Eisenhower's proposals for world cooperation in the peaceful use of atomic energy. The project has been fantastically successful. The Communists have fought it with every weapon at their command, but the U. S. Information Agency has definite and conclusive evidence that the world has heard the story and has believed it.

Communist propaganda pressures today, although not relaxed elsewhere, are heaviest in the underdeveloped countries, Asia, Latin America and Africa. The U. S. Information Agency has taken note of this fact and its programs are being adjusted accordingly. We do not have funds to match the Communists in volume of effort but we are, we think, their superiors in determination. And we have, above all, the Truth on our side.

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Du Mont International

(*Continued from page* 57)

national Airways. The unit, designated as Type APS 42B, can receive information from distances up to 200 miles. Storms in the direction of flight can be noted quickly and avoided, an important factor in passenger comfort and safety. Aircraft crossing large bodies of water on global flights can navigate more accurately than ever before by use of the Du Mont radar Type APS 42B, which has already been successfully used in military transport planes, and the Navy's new Lockheed Constellations.

This latest Du Mont radar development is a long step from the radar developed in 1933 by Dr. Allen B. Du Mont, who originally conceived the basic principles of radar as a by-product of his early research on the cathode-ray tube. At that time, as a matter of historical record, U. S. Army Signal Corps officials asked that the Du Mont patent application for radar be withheld for security reasons; a request which was adhered to by Dr. Du Mont.

It is in this field that Allen B. Du Mont Laboratories, Inc., have blazed a bright trail. Du Mont products girdle the globe and are used wherever men use precision instruments and modern communications.

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AC&R's Global Communications

(*Continued from page* 46)

flashed across the 2,350-mile span between San Francisco and Honolulu.

As AC&R's principal radio company, Mackay today operates powerful long-distance transmitting stations on the east and west coasts of the United States from which signals are beamed overseas to Europe, the Middle East, India, Africa, Latin America, islands in the Pacific, and the Far East. It maintains a total of 14 company-owned and -operated traffic and branch offices in Honolulu, Manila, and Tangier, and also has radiotelegraph connections with System-owned stations in Latin America. The Tangier station, built in 1946, relays messages between New York and points in Europe, Africa, and the Middle East.

In addition to its point-to-point services, the Marine Division of Mackay Radio, operates six powerful coastal stations in the United States that offer unsurpassed radiotelegraph service to ships at sea all over the world.

As the science of electrical communication has advanced, AC&R has been quick to adopt the latest technical developments for the improvement and expansion of its service. Teleprinters, Deskfax, and telephone equipment installed in private customer and branch offices have provided for truly high-speed communication.

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Change in Command

From General Back to General O'Connell

OVER 500 REPRESENTATIVES OF industry, government and the military gathered recently at an AFCEA-sponsored banquet to honor Major General George I. Back, upon his completion of four years of service as Chief Signal Officer of the United States Army.

This was only one of the many honors accorded the General recently, including election as a Fellow in the Institute of Radio Engineers.

General Back, who has served nearly 35 years in the Regular Army, was succeeded as Chief Signal Officer by Major General James D. O'Connell on May 1.

During World War I, General Back began his military career, later serving as an instructor at signal schools. After having served at Fort Monmouth from 1929 to 1934, he became Chief of the Plant and Traffic Division, OCSigO in 1934.

At the beginning of World War II he was stationed in Washington, but in 1944 he was transferred to Europe where he served as Deputy Chief Signal Officer of the Allied Headquarters and Chief Signal Officer in the Mediterranean.

Returning to the U.S. in 1945, General Back was named Chief of Army Communications Service in the OCSigO.

In 1947 he was sent to the Far East as Signal Officer of the Far East Command and Chief of the Civil Communications Section, Supreme Commander for Allied Powers. After the beginning of hostilities in Korea, he was appointed Signal Officer for the United Nations Command.

Major General George I. Back, former Chief Signal Officer, U. S. Army, speaking at the banquet sponsored by the Washington Chapter of the Armed Forces Communications and Electronics Association, at the Shoreham Hotel in Washington, D. C.

In 1951 General Back was recalled from duty in the Far East to assume the post of Chief Signal Officer.

During his tenure as top signal officer of the Army, the Signal Corps has recorded a number of outstanding achievements. *General Back has constantly stressed the importance of maximum cooperation with industry, and emphasized the Signal Corps' research and development program.*

In the four years he served as Chief Signal Officer, he helped to carry out his philosophy of teamwork between the military and industry through his position as a national vice president and director of the Armed Forces Communications and Electronics Association.

The incoming Chief Signal Officer, General O'Connell, graduated from the U.S. Military Academy in 1922. In 1928 he became an instructor at the Signal School at Fort Monmouth and remained there until 1936.

From Fort Monmouth, General O'Connell was transferred to the OCSigO as Chief of the General Development Branch. He was named Executive Officer of the Signal Supply Service, OCSigO, in 1943, and later in that year, became officer-in-charge of its Technical Section.

From 1944 to 1945 he served in England, France and Germany as chief of the Requirements Branch, Signal Section, 12th Army Group.

Returning to the United States in 1946, he became Director of the Signal Corps Engineering Laboratories at Fort Monmouth.

In 1947, General O'Connell was appointed Signal Officer of the Eighth Army in Japan. Named a member of the Signal Corps Board at Fort Monmouth in September of 1949, he was later named Deputy President of the Board in October of that year.

In December of 1951, he assumed duties as the Deputy Chief Signal Officer, the post he held immediately prior to his new assignment.

Upon taking office as Chief Signal Officer on May 1, General O'Connell became the seventeenth Chief Signal Officer of the U.S. Army, climaxing 33 years' service to the Army.—J.H.S.

Pictured below are the incoming and outgoing Chief Signal Officers and their wives on the occasion of the banquet given in their honor by the Armed Forces Communications and Electronics Association. Left to right are: Maj. Gen. George I. Back, Mrs. James D. O'Connell, Mrs. George I. Back and Maj. Gen. James D. O'Connell.

Association Affairs

Admiral Ammon Resigns as AFCEA Vice President and Director

Rear Admiral William B. Ammon, Director of Naval Communications until February of this year, has resigned as a national vice president and director of the AFCEA. He has now assumed command of Battleship Division 2 in the Atlantic Fleet.

He has devoted a large part of his military career to naval communications since his graduation from the U. S. Naval Academy in 1923.

From 1934 to 1936 he served with the Communications Division of the Chief of Naval Communications. Other assignments included Assistant Chief of Staff for communications with the Pacific Fleet in 1937 and Assistant Director, Naval Communications from 1948 to 1951.

Admiral "Bill" Ammon became a vice president and national director of the Association in 1952 when he was named Director of Naval Communications.

Rear Admiral Henry C. ("Chet") Bruton, USN, has succeeded Admiral Ammon as Director of Naval Communications (SIGNAL, March-April 1955, p. 66).

Introducing AFCEA's New Group Members

Control Engineering Corp.

Control Engineering Corporation of Norwood, Massachusetts, manufacturers of precision instruments, joined the Association as a group member in March.

The following company representatives have been named to membership in the Association: William A. Jones, president; George B. Foote, vice president and treasurer; Roscoe J. Cooper, manager, government contracts; George S. Cherniak, engineering vice president; John S. Hall, chief mechanical engineer; John B. Harper, systems engineer; Patrick C. McFaull, manager, government sales; Stanley D. Peirce, contracts department; Edward L. Swainson, chief components engineer; and F. Robert Zatlin, chief systems engineer.

Electro Tec Corporation

Another new group member of the AFCEA is Electro Tec Corporation of South Hackensack, New Jersey, designers and manufacturers of slip ring assemblies and commutators.

The following have been designated by the company to be AFCEA company representatives: George J. Pandapas, president; Arthur A. Asch, vice president and general manager; Earl Miller, treasurer; A. T. Clarke, director of sales; Karl J. Klarman, director of engineering; Harry Frank, production manager; Richard R. Getter, chief project engineer; George Merker, chief design engineer; Robert J. Schmitt, special sales division; and Arthur Buckley, manager, quality control.

Packard-Bell Company

The Packard-Bell Company, Los Angeles, California, producer of electronic equipment, became a group member of the AFCEA during March.

Representatives from this company are: Robert S. Bell, executive vice president; William H. Moore, assistant to the president; A. J. Spriggs, production manager, Technical Products Division; George W. Fenimore, administrative manager, Technical Products Division; O. C. Bowers, chief engineer, Technical Products Division; Sam F. Arn, engineering sales manager, Technical Products Division; Waldo Hodson, assistant chief engineer, Technical Products Division; R. G. Leitner, chief research engineer, Technical Products Division; Dr. E. L. Michaels, chief, Advanced Development Section, Technical Products Division; and William H. Bailey, Washington representative.

Transistor Products, Inc.

During April, Transistor Products, Inc., of Waltham, Massachusetts, manufacturers of transistors and diodes, became a group member of the AFCEA.

The following officials have been chosen to be company representatives in the Association: R. B. Holt, president; M. G. Stratton, executive vice president and treasurer; A. Coblenz, assistant to the president; E. F. Giguere, director of sales; T. X. Cronin, assistant to executive vice president; E. J. Quirk, works manager, B. D. Pendergast, plant services manager, S. Rubinovitz, assistant to director of sales.

New AFCEA Chapter

Rome (Italy)

Another overseas chapter was added to the AFCEA roll late in March. The application for charter for a Rome Chapter was signed by twenty-six members following an organizational meeting on February 11th. The chapter was organized through the efforts of M. Robert Paglee, RCA Engineer, MAAG.

GENERAL LANAHAN RETIRES FROM ACTIVE SERVICE

Major General Francis H. Lanahan, USA, retired from the Army on March 31st, terminating a great career of 38 years in military communications-electronics.

During World War II he was appointed Deputy Chief Signal Officer of Supreme Headquarters Allied Expeditionary Force (SHAEF), serving in that capacity through the Normandy landings, and finishing the war as Chief Signal Officer of SHAEF.

When SHAEF was dissolved in 1945, General Lanahan, or "Duke" as he is known to his friends, became the first CSO of the post-war U. S. Forces, European Theater. It was while he served in this post that he

Citation presented to General Lanahan, signed by President Eisenhower, General Ridgway and General Gruenther.

Francis H. Lanahan
Major General
United States Army
In appreciation for 35 years of Distinguished Service
culminating in an unsurpassed performance in the field of
communications on behalf of the
Allied Nations of the Free World
Dwight D. Eisenhower
President of the United States
Matthew B. Ridgway
Gen. Matthew B. Ridgway USA
Chief of Staff, United States Army
Alfred M. Gruenther
Gen. Alfred M. Gruenther USA
Supreme Commander, Allied Powers Europe

organized the European Chapter of the AFCEA and served as its first president.

Returning to the U. S. in 1947, he commanded the Signal School at Fort Monmouth and while at this post was an AFCEA national director.

From Fort Monmouth General Lanahan returned to Europe to be the first Chief Signal Officer of NATO. While at his NATO post, he was instrumental in the formation of the AFCEA Paris Chapter.

Leaving his job at NATO, he returned to the States to become Assistant Deputy Chief of Staff for Logistics, the assignment he held until his retirement. While serving in this capacity, he took an active part in the AFCEA Washington Chapter activities and served as a vice president and director.

Mrs. Theodore Gary Dies

Mrs. Laura Gary, wife of Theodore S. Gary, a National Director of the AFCEA and a former president of the Association, died recently in Miami Beach, Florida, of injuries suffered in an automobile collision.

Mrs. Gary was known to many members of the Association and their wives, as she always took an active part in AFCEA Convention activities, and is especially remembered for her work as chairman of the ladies' program at the 1952 Convention in Chicago.

Mr. Gary, President of Theodore Gary & Company and Chairman of the Automatic Electric Sales and International Automatic Electric Companies, has long been prominent in the communications field.

Admiral S. C. Hooper Dies; First Fleet Wireless Officer

Rear Admiral Stanford C. Hooper, USN, Ret. the Navy's first fleet wireless officer and a pioneer in developing radio for the Navy, died recently in Miami Beach, Florida.

In 1928 he became Director of Naval Communications and held that post for six years.

He was director of the Navy's radio liaison division from 1940 until he retired in 1944. Since then he had been a consultant for several leading manufacturers of electronics equipment.

Admiral Hooper had long been an active member of the Armed Forces Communications and Electronics Association.

MOBILE COMMUNICATION CENTERS

Radio Engineering Products has been continually in production of mobile communication centers for various NATO headquarters and for the U.S. Signal Corps Engineering Laboratories, over a period of several years. The centers produced have included type AN/MSC-1, type AN/MSC-5, and type AN/MSC-12, which have been or are being manufactured in full accordance with U.S. Signal Corps specifications. There have also been produced systems engineered by us to the specific requirements of a headquarters.

These systems have employed in some instances trailers and tractors of modified commercial types supplied by us, in some instances standard military-type vehicles supplied by us, and in some instances the using agency has supplied standard military-type tractors, trailers and trucks.

These centers have provided in mobile form, some or all of the following functions, in some cases in very complex and extensive form:

- **Operations rooms for signal officers and commanders.**
- **Teletype conference viewer facilities.**
- **Teletype switchboards up to 120 lines.**
- **Telephone switchboards up to 600 lines.**
- **Testing of military and civil wire facilities.**
- **V-H-F and U-H-F broadband radio-relay terminals and repeaters.**
- **Multi-channel carrier-telephone and carrier-telegraph systems for superposing on wire and radio facilities.**
- **H-F frequency-shift radio transmitting facilities, and matching dual-diversity receiving positions.**
- **Teletype message-center, tape-relay, and cryptographic facilities.**
- **Mobile diesel power plants.**

Radio Engineering Products has a broad and extensive knowledge of this subject, unparalleled plant facilities, and a team of engineers, production executives, and craftsmen which place us in a unique position in this field. We will gladly supply estimates on mobile comcenters to specific requirements on request.

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F. R. Kappel
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David Sarnoff
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Fred J. Turner

**Executive Committee Member*
†Executive Committee Member, non-voting

NOT FOR SALE!

(YET)

THIS TRANSISTORIZED TELEMETER IS ONLY A "PROGRESS REPORT"

This 3-channel transistorized telemeter although not yet available for sale as standard equipment, is indicative of the advanced thinking of **Bendix-Pacific** engineers and represents another example of this Division's efforts to have new designs available in advance of rapidly expanding instrumentation requirements. This particular unit includes a transmitter and three subcarrier oscillators, all encapsulated as a single plug-in component. Although present development has been confined to the solution of special instrumentation problems, a possible pattern for future telemeters is indicated. The special features of transistorized components — extremely high shock resistance — low heat generation — very low power consumption — small size — light weight — provide design tools for a major advance in instrumentation techniques.

Imagination at ***Bendix-Pacific*** *today is building better products for tomorrow.*

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From the President

AFCEA National President George W. Bailey greets the 9th Annual Convention with a message of importance to all members.

I should like to extend to each of you a very warm welcome to our 9th Annual Convention.

This important event is the high point in the yearly activities of the AFCEA. It provides a wonderful opportunity for those with common pursuits in civilian and in military life to become better acquainted with one another. More than that, it serves to focus the attention of this unique military-civilian partnership on specific areas within the communications-electronics-photography field which are vital to our national security.

One of the most important of these areas has been chosen as the theme of this year's convention, i.e., "global communications." This is a particularly wise choice because it is a topic which has not received the wide-spread attention it merits. It is paradoxical that, while we have become *inter*nationally minded in affairs of state, we have remained primarily *intra*national in our considerations of the apparatus and techniques which are available to us for communication.

The importance of global communications to the nation becomes at once obvious when one reflects on the far-flung disposition of our armed forces in peacetime, as well as in war. I therefore earnestly recommend to your attention the deliberations of this convention and the subject which predominates its activities—*global communications.*

George W. Bailey

9th Annual AFCEA Convent
featuring Global Communicatio

Program

Thursday, May 19	*Event*	*Place*
8:00 AM - 4:00 PM	Registration	Grand Ballroom Foyer
4:00 PM - 7:00 PM	Registration	Check Room Floor
9:00 AM - 7:00 PM	Inspection of Exhibits	East and West Ballrooms Rooms "B" and "C"
9:30 AM	Meeting of AFCEA Chapter Presidents	South Room
2:15 PM	Pageant of Communications Progress and Symposium on Global Communications followed by inspection of Pageant exhibits	Grand Ballroom
6:00 PM	Social Hour	Grand Ballroom Foyer, East and West Ballrooms
7:15 PM	Buffet Dinner	Grand Ballroom
Friday, May 20		
8:00 AM - 7:00 PM	Registration and Inspection of Exhibits	Same as above
9:30 AM	Meeting of AFCEA Board of Directors and National Council	South Room
1:00 PM	Assembly for tour of United Nations Building	South Room
6:00 PM	Social Hour	Grand Ballroom, East and West Ballrooms
7:15 PM	9th Annual AFCEA Banquet	Grand Ballroom
Saturday, May 21		
8:30 AM - 9:00 AM	Assembly for Fort Monmouth Bus Trip	Lobby of Hotel, 42nd Street Side
10:30 AM - 11:30 AM	Arrival and Reception at Fort Monmouth *(Cameras may be used at Fort Monmouth)*	Gibbs Hall
11:45 AM	Tour of Fort Monmouth includes Luncheon, Social Hour and Light Buffet Supper	
6:15 PM	Busses load for return to New York	Gibbs Hall Entrance

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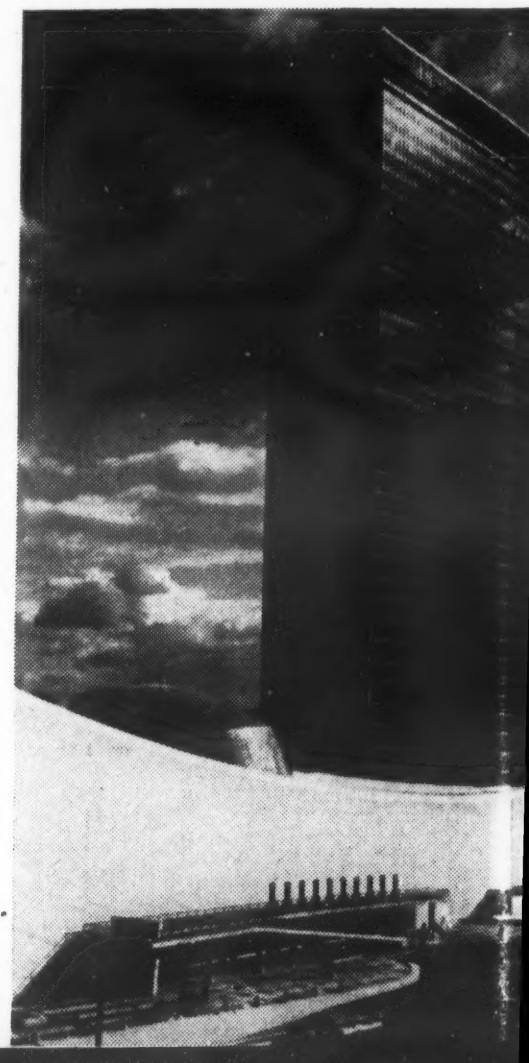
Ladies: The Hospitality Committee for the ladies will be on duty at all times at the Registration Desk. The ladies are invited to participate in all of the activities scheduled for the Convention, but, in addition, the Hospitality Committee will be glad to obtain theater tickets, suggest restaurants and sight-seeing tours, and be as helpful as possible to make the ladies' time at the Convention most enjoyable.

Convention Host

Allen B. Wharton
President
AFCEA
New York Chapter

Convention Chairman

Benjamin H. Oliver, Jr.
Vice President
AFCEA
New York Chapter



The United Nations Building

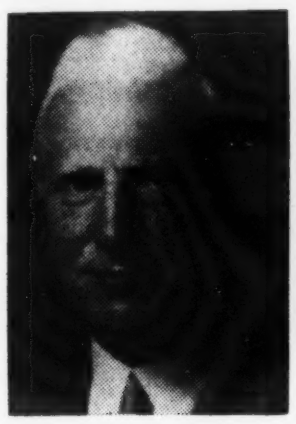
May 19-20-21, 1955
Hotel Commodore, New York, N.Y.
Fort Monmouth, N. J.

Senator Leverett Saltonstall

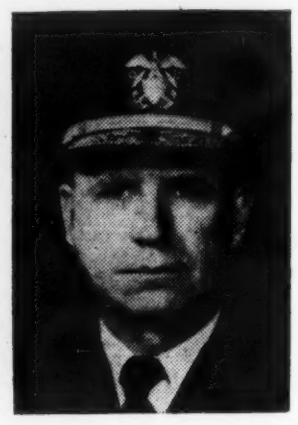
Maj. Gen. James D. O'Connell, USA

Maj. Gen. Gordon A. Blake, USAF

William H. Harrison



Maj. Gen. Rex V. D. Corput, Jr., USA



RAdm. Henry C. Bruton, USN

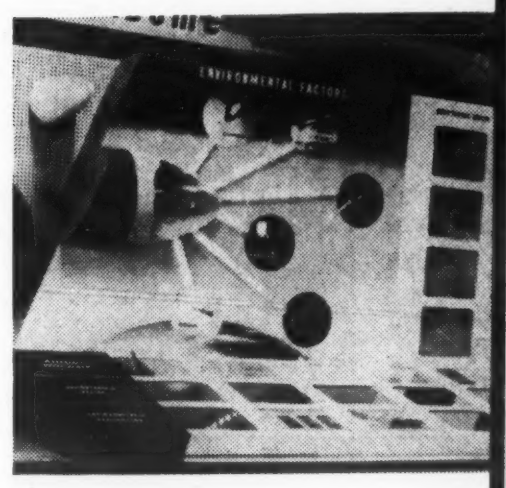
Speakers:

Leverett Saltonstall, senior Senator from Massachusetts and ranking Republican member of the Senate Armed Services Committee, will deliver the address at the 9th Annual AFCEA Banquet. The topic is unannounced because the Senator wishes to select the most current and vitally important issue at the time of the Banquet.

The panel arranged for the Symposium on Global Communications gathers together the best informed speakers on this subject. *Major General James D. O'Connell, USA*, Chief Signal Officer, U. S. Army; *Major General Gordon A. Blake, USAF*, Director of Communications, U. S. Air Force; *Rear Admiral Henry C. Bruton, USN*, Director, Naval Communications; *Major General Rex V. D. Corput, Jr., USA*, Chairman, Joint Communications-Electronics Committee of the Joint Chiefs of Staff, and *William H. Harrison*, President, International Telephone and Telegraph Corporation, all represent the most up-to-date knowledge and are the best equipped to report to AFCEA members on the past, present, but especially, *future* of global communications for the world today.

Exhibits:

The first activity scheduled for the Convention is the "Pageant of Communications Progress." This "live" display of communication equipment from the earliest telegraph and telephone instruments to present-day electronic wonders will be presented to the audience, with historical narratives, by *NBC Commentator Ben Grauer*. Exhibits from all of the military services will be featured in the East and West Ballrooms and in Rooms "B" and "C." Signal Corps, Navy and Air Force displays include actual equipment in operation and working models of complete communications installations. At Fort Monmouth, the Armed Forces Day (May 21) celebration will complete the exhibits with those too heavy to be taken into the hotel. All the Services will be represented in the Fort Monmouth exhibits. The permanent exhibit of the Convention is this souvenir issue of SIGNAL — an "Exhibition in Print," both in editorial and advertising content.



Tours:

The special tour of the United Nations Building scheduled for Friday afternoon will be conducted for all Convention members by the professional guides at the Building. During the tour, *Major General Frank E. Stoner, USA(ret)*, first Chief of Communications for the United Nations, will greet the assembly. The all-day trip to Fort Monmouth on Saturday is open to all members and guests. The closing ceremony, the Retreat Review, will climax a full day of tours, air shows, exhibits and social gatherings.

AFCEA Group Members

Communications—Electronics—Photography

Listed below are the firms who are group members of the Armed Forces Communications and Electronics Association. By their membership they indicate their readiness for their share in industry's part in national security. Each firm nominates several of its key employees or officials for individual membership in AFCEA, thus forming a group of the highest trained men in the electronics and photographic fields, available for advice and assistance to the armed services on research, development, manufacturing, procurement, and operation.

Admiral Corporation
Air Associates, Inc.
Aircraft Radio Corp.
Allied Control Co., Inc.
Allied Radio Corporation
Almo Radio Company
American Cable & Radio Corp.
American Institute of Electrical Engineers
American Machine & Foundry Co.
American Phenolic Corporation
American Radio Relay League
American Telephone & Telegraph Co.
Ampex Electric Company
Anaconda Wire & Cable Company
A. R. F. Products, Inc.
Argus Cameras, Inc.
Arnold Engineering Company
Atlas Precision Products Co.
Audio Products Corporation
Automatic Electric Company
Automatic Electric Sales Corp.
Automatic Telephone & Electric Co., Ltd.
Barry Corporation, The
Bell Telephone Company of Pa.
Bell Telephone Laboratories, Inc.
Bendix Radio
Berkshire Transformer Corp.
Bliley Electric Company
Bomac Laboratories, Inc.
Breeze Corporations, Inc.
Bruno-New York Industries Corp.
Burnell & Company
California Water & Telephone Co.
Cambridge Thermionic Corp.
Capehart-Farnsworth Co.
Capitol Radio Engineering Inst., Inc.
Cargo Packers Inc.
Carolina Telephone & Telegraph Co.
Central Technical Institute
Chesapeake & Potomac Tel. Co.
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Collins Radio Company
*Control Engineering Corp.
Copperweld Steel Company
Cornell-Dubilier Electric Corp.
Craig Machine, Inc.
Crosley Division-Avco Mfg. Corp.
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Designers for Industry, Inc.
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DuMont, Allen B., Laboratories, Inc.
Eastman Kodak Company
Electronic Associates, Inc.
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Federal Mfg. and Engineering Corp.
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General Telephone Corp.
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Guardian Electric Mfg. Co.
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Haloid Company
Hammarlund Manufacturing Co., The
Hazeltine Electronics Corp.
Heinemann Electric Company
Hercules Motor Corp.
Hitemp Wires, Inc.
Hoffman Laboratories Incorp.
Hopkins Engineering Co.
Hughes Aircraft Company
Illinois Bell Telephone Co.
Indiana Bell Telephone Co.
Indiana Steel & Wire Co.
Institute of Radio Engineers
International Business Machines
International Resistance Co.
International Tel. & Tel. Corp.
Jacobsen Manufacturing Co.
Jansky & Bailey, Inc.
Kay Lab
Kellogg Switchboard & Supply Co.
Keystone Electronics Co.
Kleinschmidt Laboratories, Inc.
Lavoie Laboratories
Leich Sales Corporation
Lenz Electric Manufacturing Co.
Lewyt Corporation
Librascope, Inc.
Loral Electronics Corporation
Machlett Laboratories, Inc.
Magnavox Company
Maida Development Company
Mallory, P. R., & Co., Inc.
Marion Electrical Instrument Co.
Merit Coil and Transformer Corp.
Michigan Bell Telephone Company
The Montgomery Company
Motorola, Inc.
Mountain States Tel. & Tel. Co.
Muter Company, The
Mycalex Corporation of America
National Company, Inc.
Nelson Technical Enterprises
New England Tel. & Tel. Co.
New Jersey Bell Telephone Company
New York Telephone Company
Northwestern Bell Telephone Co.
Oak Manufacturing Co.
Ohio Bell Telephone Co.
O'Keefe & Merritt Company
Otis Elevator Co., Electronic Division
Pacific Mercury Television Mfg. Corp.
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Phebco, Inc.
Phelps Dodge Copper Products Corp.
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Plessey Company, Ltd., The
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Radio Frequency Laboratories, Inc.
RCA Photophone, Ltd.
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Raymond Rosen Engineering Products, Inc.
Ray-O-Vac Company
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Red Bank Division Bendix Aviation Corp.
Reeves Instrument Corp.
Remington Rand, Inc.
Remler Company, Ltd.
Rocke International Corp.
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Society of Motion Picture & Television Engineers
Sonotone Corporation
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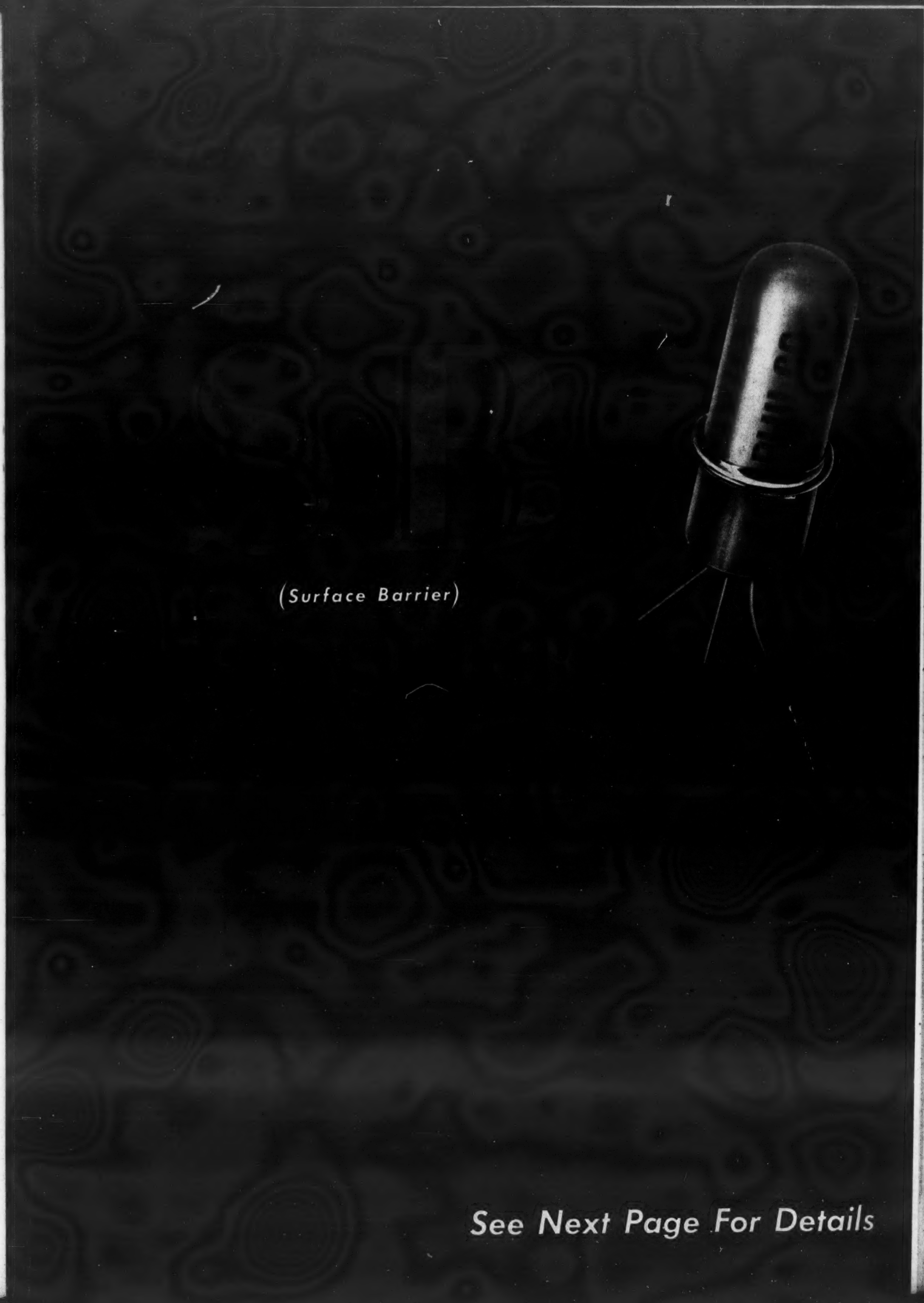
Wilcox Electric Co., Inc.
Willard Storage Battery Company
Wisconsin Telephone Company
Wollensak Optical Company
Zenith Radio Corporation

*Company accepted for AFCEA Group Membership since the last issue of SIGNAL.


(Surface Barrier)
See Next Page For Details

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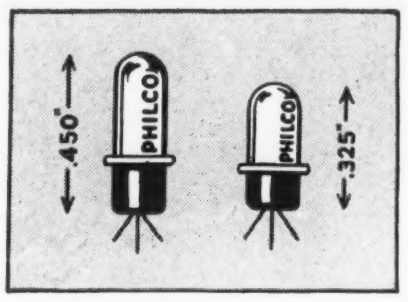

Philco SB Transistors are available in the sizes shown here—standard and miniature.

Today, Philco's new SB Transistor opens up a completely new field of commercial, industrial and military applications for the electronics design engineer. With vastly superior performance assured to 50mc and above, many basic circuits can now be *completely transistorized.* Video bandpass amplifiers, wide band low-pass amplifiers, high frequency oscillators and high speed switching are only a few of the innumerable circuits which the design engineer can produce quickly, easily, efficiently with the revolutionary new SB Transistor.

UP TO 10 TIMES BATTERY LIFE

The Philco Surface Barrier Transistor operates efficiently with power consumption of less than *one* milliwatt! This extremely low power drain results in up to *ten* times the battery life obtainable with junction transistors, vastly reducing operating costs. Hermetically sealed, the SB Transistor has greater inherent characteristics of stability, longer life and higher efficiency than any other type of transistor

HIGHEST UNIFORMITY YET ATTAINED

Due to Philco's unique design and precision production methods, the SB Transistor reaches a degree of uniformity and unvarying quality never before achieved with transistors. This remarkable quality permits design engineers to specify the Philco SB Transistor with full assurance of superior performance.

Now being produced in quantity this new Philco SB Transistor is available for your current projects and immediate shipment can be made to you.

For complete technical information on the PHILCO SB Transistor write Dept. S

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Iowa State College, Ames, Iowa
New York University, N.Y.C.
Northeastern University, Boston, Mass.
Norwich University, Northfield, Vt.
Pennsylvania State Univ., Univ. Park, Pa.

National Headquarters Chapters Secretary: Julia B. Godfrey

Chapter News

Augusta-Camp Gordon

Guest speaker at the chapter's February 17th dinner-meeting was Rabbi Norman M. Goldburg, prominent Georgia rabbi and Army Reserve chaplain. Rabbi Goldburg gave a thought provoking talk on "Difficulties in Communications between People," stressing mutual understanding and cooperative action between peoples and nations.

The Military Affiliate Radio System was highlighted at the March 17th meeting at Timmerman's Restaurant, with Capt. Neal B. Kindig, Director of MARS at Camp Gordon, conducting the program.

Captain Kindig presented an informative talk on the mission and operations of MARS, augmented by slides, a display of operating equipment and various demonstrations. The demonstrations included participation by Brig. Gen. Francis E. Howard, Commanding General of Camp Gordon, from a mobile unit traveling on the Camp Gordon reservation, Brig. Gen. S. P. Collins, Commanding General of the Signal Corps Training Center, from the lounge at Timmerman's, and Mrs. G. W. Freiberg, Director of Civil Defence for the Augusta area, from a mobile unit located at the Civil Defense Center in Augusta.

Baltimore

In lieu of a meeting in February, the chapter held a Valentine dinner-dance in the Officers' Club at Fort Meade. One hundred and sixty members and guests turned out for a most enjoyable evening which began with a delicious buffet dinner. Music was supplied by the Army Band.

Boston

The March 10th meeting sponsored by the Railroad Community Committee at Boston's famous South Station was an outstanding success. The large turnout included chapter members and guests, railroad representatives, and members of the Northeastern University Student Chapter.

The AFCEA group was welcomed by James V. Whalen, General Passenger Agent, New Haven Railroad, on behalf of J. G. Patten, Chairman, Railroad Community Committee of Greater Boston.

NOTE TO OTHER CHAPTERS:

The Railroad Community Committee of Greater Boston advises that Railroad Community Committees are located throughout the nation and that programs similar to the one staged for the Boston Chapter could be worked out for other AFCEA chapters.

Chapter President David R. Hull and Col. T. L. Bartlett, AFCEA Regional Vice President, also addressed the gathering.

Chairman of the meeting was Arthur S. Mullins of the New York Central Railroad who presented messages in behalf of the three railroad presidents unable to attend due to prior engagements. He also introduced R. J. Cullen, Signal Engineer, New York Central System, and W. A. Ford, Signal Engineer, New Haven Railroad.

The principal address of the evening was delivered by Edwin K. Bloss, Mechanical Superintendent, Boston and Maine Railroad, on the use of electronics by railroads.

At the close of the meeting, the members and guests were taken on a tour of Tower 1, South Station, where they witnessed a live demonstration of Centralized Traffic Control. They also visited the electronically operated reservation bureau and the telephone center.

000 miles of transmission lines are used by Air Defense, he said. Their wire system includes several individual networks, and there are some 1000-odd long line circuits in the AC&W network for operations, intelligence, scramble return-to-base, weather, etc. He also stated that 8,300 miles of automatic teletype reporting circuitry is required in the nationwide net to provide tactical information from all parts of the country to the CONAD Headquarters Combat Operations Center.

Touching on problems still to be solved, Col. Nichols commented that an area of communications activity often overlooked is electronic navigation.

Two Air Force films were shown during the evening—"Mrs. Jones, Meet Your Partners" and "Air Force Americana."

Dayton-Wright's February meeting was addressed by Lt. Col. F. K. Nichols, Air Defense Command. Shown, l to r, are: Col. Nichols; Kitty Thompson, chapter secretary; and Col. F. J. Shannon, chapter vice president.

Dayton-Wright

"This is How Communications and Electronics Does its Daily Job in Air Defense" was the subject of a talk by Lt. Col. F. K. Nichols, Air Defense Command Headquarters, at the February 24th chapter meeting.

Colonel Nichols described the establishment of the Continental Air Defense Command, or CONAD, of which the Air Force element, the Air Defense Command, is a major part. Naming the four essential steps in the fulfillment of the ADC mission as detection, identification, interception and destruction, he emphasized that communications and electronics are directly involved in all four.

In wire communications alone 500,-

The dinner-meeting was held at the Dayton Biltmore Hotel, with seventy members and guests present. Among the guests was Dr. H. L. Hull, President, Farnsworth Electronics Co., Fort Wayne, Ind.

Decatur

Color television was the feature of the February 17th meeting which drew an attendance of 125 members and guests.

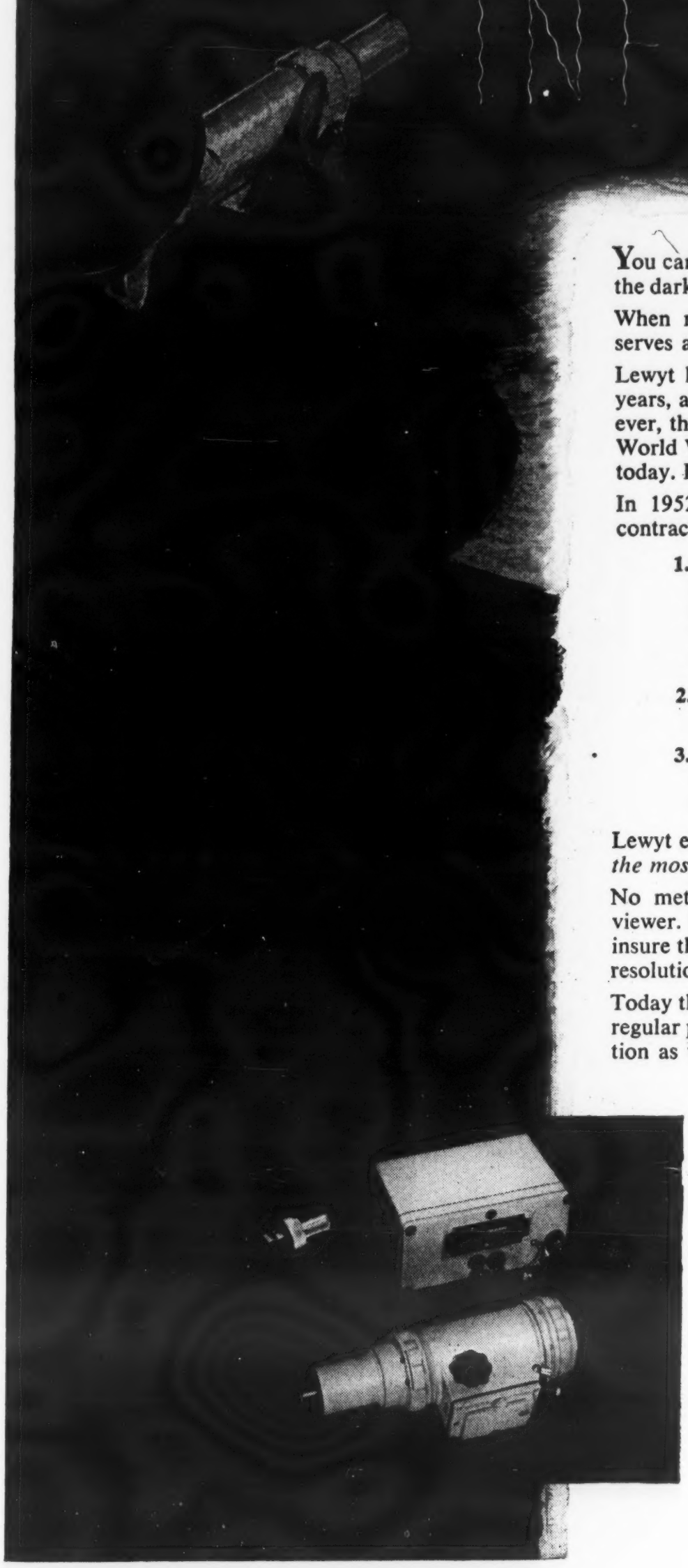
The program began with a color television show "Shower of Stars" over Station WCIA, Champaign, and was followed by a technical talk on color television circuitry by a member of the staff of the Crum (Philco) Distributing Company, which furnished the receiving equipment for the meeting.

A lively question and answer period was conducted at the close of the program.

On March 23rd, the chapter was a

How helps the fleet read "invisible messages" with...

INFRA-RED!



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When radio silence is ordered, this amazing "invisible light" serves as a vital communications line.

Lewyt has been producing infra-red equipment for the last 15 years, and is ever broadening its development in this field. However, the thousands of Infra-red Viewers made by Lewyt during World War II are primitive compared with those built by Lewyt today. Rapid strides have been made in the past few years.

In 1952 the Navy awarded Lewyt the first of a number of contracts to:

1. **Design and produce an infra-red viewer incorporating an optical system specifically designed for the near infra-red spectrum. Lenses used in earlier viewers had not been corrected or coated for the infra-red wave length**
2. **Engineer a high voltage focusing circuit with completely interchangeable parts to facilitate field servicing.**
3. **Design and develop a 20,000 volt transformer power supply that would operate from the 110 volt AC power source available on shipboard.**

Lewyt engineers met the challenge—*to produce what is probably the most sensitive infra-red viewer thus far made.*

No method existed for production-line inspection of such a viewer. Lewyt engineers had to design special test equipment to insure that all units would meet the highest quality standards for resolution and sensitivity—even under adverse field conditions.

Today the Lewyt-built Infra-red Viewer and Power Supply are in regular production. They will soon be used by the Fleet for detection as well as signalling. In addition, they will be used by the Treasury Department for uncovering forgeries and by the FBI in criminology.

Infra-red is one more field in which Lewyt helps the Armed Forces keep their defenses up. Lewyt employs 1,800 trained workers at all times—busy in peace, ready for emergencies.

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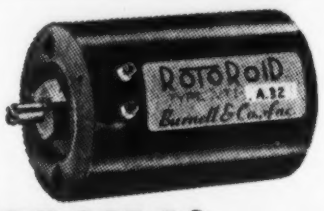

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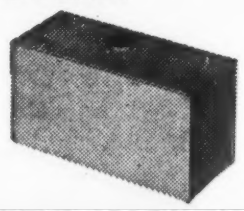
TOROIDS Combining the advantages of toroidal type winding with the molybdenum permalloy dust core and other specially selected materials, these toroids provide higher Q, greater stability of inductance vs. temperature, and level in a smaller space. Supplied to an inductance accuracy of 1%. Available in standard, miniature and sub-miniature sizes.



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FIRST IN TOROIDS AND RELATED NETWORKS

Decatur Chapter was joint sponsor of a reception in honor of two Chinese Nationalist signal officers on March 23rd. Seated, l to r, are Decatur Mayor Robert E. Willis, Maj. Gen. Houying Koo, Col. Tsan-ching Wu, and Capt. John J. Sen, foreign office tour director for the U. S. Army Chief of Staff. Standing are Henry H. Bolz, left, Association of Commerce general manager, and Lt. Col. Jack E. Willis, acting commander, Decatur Signal Depot.

joint sponsor of a reception in honor of two Chinese Nationalist signal officers who were visiting the Decatur Signal Depot on an orientation tour of Signal Corps installations being conducted under the Mutual Defense Assistance program. The officers were Maj. Gen. Hou-ying Koo, deputy chief signal officer for supply and maintenance of the Chinese Nationalist combined service forces, and Col. Tsan-ching Wu, chief signal officer for general headquarters.

Lt. Col. Jack E. Willis, acting depot commander, was host for the occasion which was attended by some one hundred military and civilian depot officials and guests. Decatur Mayor Robert E. Willis headed a delegation of civic leaders who greeted the visiting officers.

Fort Monmouth

Frank L. Bradley, engineering manager of Forstmann Woolen Company, addressed the February 24th dinner-meeting at Gibbs Hall.

Speaking on the subject, "The Engineer and his Relation to Management," Mr. Bradley discussed the increasingly important role management engineering plays in the daily responsibilities of the technical engineer. He described management generally as "directing human effort" and suggested that engineers apply scientific methods to a consideration of eventual managerial duties. Pointing out that half the major national corporations are headed by executives with engineering-scientific backgrounds, he added, "the analytical mind of the engineer should be invaluable to the manager who must base his decisions on judgment and experience."

Emphasizing that management requires more than technical knowledge, Mr. Bradley advised "your performance in your present engineering position will have a vital effect on your future advancement." He recommended further educational advancement particularly in management courses.

Mr. Bradley concluded his talk with a four point program upon which he has found management bases selection

Montgomery Area Chapter's March 29th meeting was addressed by Col. George P. Dixon, AFCEA Executive Vice President. Shown during the social hour which preceded the meeting are, l to r: Col. Francis R. Delaney; Lt. Col. George D. Meserve, chapter president; Major Wesley C. Royer; and Col. Dixon.

for advancement to supervisory positions: capacity for leadership, individual intellectual ability, capacity for administration, and courage and ability to make decisions.

As guest speaker at the chapter's March 24th meeting, Dr. Daniel E. Noble, vice president of communications and electronics and director of Motorola, Inc., defended science and engineering in a talk called "Problems and Horizons."

Dr. Noble stated that science and engineering have done away with slavery and witchcraft and produced a better daily life for man. He developed the thesis that hope for ultimate world peace rests more in the hands of the engineers and scientists than it does upon the shoulders of the diplomats and politicians. It was his prediction that science and engineering would develop more advances within the next twenty-five years than the world has ever seen.

One of the foremost men in the electronics field in the United States, Dr. Noble is perhaps best known for the part he played in the development of the battle-famous SCR-33 "Walkie-Talkie," the piece of radio equipment used so effectively by the Signal Corps. In 1947 he received the IRE Fellow Award in recognition of his contributions to the design and application of VHF voice communication for police and other emergency service.

Hawaii

A spring social was held at the Pearl Harbor Officers' Mess on March 4th with the Navy as host for the occasion.

The evening featured a cocktail hour, buffet dinner, Hawaiian entertainment and dancing. The chapter reported that "good fellowship was the keynote of the function, which was replete with informal Aloha attire, wonderful weather and dancing under a full tropic moon."

London

"Communications and Navigational Aids at London Airport" was the subject of a talk by Squadron Leader W. P. Nichol, Senior Signals Officer at London Airport, before the February 10th meeting of the London Chapter.

Squadron Leader Nichol discussed the facilities and problems at the London Airport and, although electronics has made great strides in helping to handle the traffic problems of a large airport, his talk vividly illustrated there is much yet to be done to handle the ever-increasing volume of traffic on schedule. His comments on maintenance and required performance of equipment were particularly interesting.

At the conclusion of his talk, the speaker showed some slides of the new buildings under construction at London Airport which are planned to be open this Spring. He also invited the AFCEA members to visit the new buildings and inspect the equipment and other facilities he had discussed.

The dinner-meeting was held in the U. S. Embassy Theater, No. 5 Grosvenor Square, with some fifty members and guests present.

New York

"Progress of the Electronic Age in Aircraft Navigation" was the subject of an address by Mr. A. Boldridge of the Allen B. DuMont Laboratories before the February 24th dinner-meeting.

Mr. Boldridge presented an interesting review of the advances made in aids to navigation from the end of World War II to the present time, and illustrated his talk with slides showing various types of direction finders, radar types of altimeters and marker beacons.

A report on national activities of the association was made by Col. George P. Dixon, Executive Vice President, during the business session.

The meeting was held at the 71st Regiment Armory, with 130 members and guests present.

North Texas

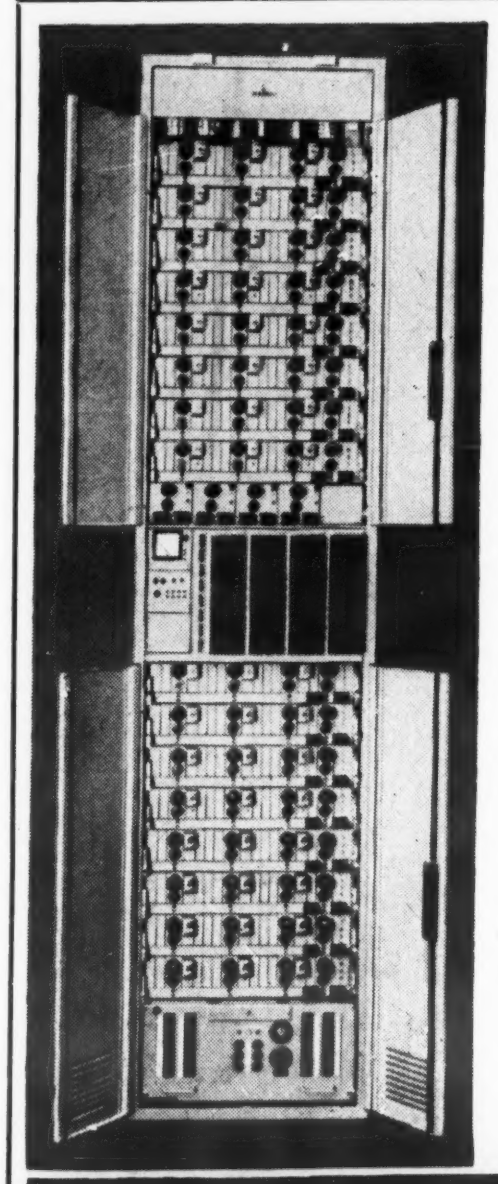
The chapter held a dinner meeting on February 9th in honor of National President George W. Bailey who was in Dallas for the Southwestern Area IRE convention. Mr. Bailey reviewed the progress of the association, tracing its origin and history, and emphasized the many ways in which the military and civilian members are working together toward national security.

Col. George L. Richon, president of the South Texas Chapter and AFCEA regional vice president, and Howard H. Davenport, vice president of the South Texas Chapter, were also present and addressed the chapter briefly.

Shown at the March meeting of the Fort Monmouth Chapter, l to r: Lt. Col. John Fill; Dr. Daniel E. Noble, Vice President, Motorola, Inc., guest speaker; and Halsey F. Hubbard, chapter vice president.

A tour of Radio Station WBAP, Fort Worth, was the program feature of the March 21st meeting which was followed by dinner at the Western Hills Hotel.

New officers were elected for the coming year as follows: president—Howard L. Housley, Automatic Electric Sales, Inc.; vice-presidents—Lt. Col. R. H. Vinding, Signal Section, General Depot, Fort Worth, and H. J. Wissemann, Texas Instruments, Inc.; secretary-treasurer—J. A. Gustavus, American Telephone and Telegraph Company. The election of a board of



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directors was deferred until the next meeting.

Northwest Florida

Major General Gordon A. Blake, Director of Communications, USAF, and Colonel George P. Dixon, AFCEA Executive Vice President, were feature speakers at the charter presentation ceremony at Eglin AFB on March 15th.

General Blake, who is also first vice president of the association, made the opening address and emphasized that communications are a vital link in our chain of defense. He said, "It is a question of civil defense and our vulnerability to atomic attack. Without communications to tie our national defense together, chaos would develop." Equally emphasized was the importance of maintaining an active liaison between military and civilian personnel and agencies for the purpose of fostering discussions and exchange of information and ideas relative to the application and use of communications, electronics and photography equipments and techniques in support of national defense.

Colonel Dixon gave the membership a comprehensive picture of AFCEA national affairs, as well as a review of the association's history, dating back to the "flag signalling" of the 1850's.

Following presentation of the charter by General Blake to Lt. Col. Francis E. Quinlan, chapter president, the members and guests convened in the Officers' Club for a chapter sponsored party.

Northwest Florida Chapter charter is presented to Lt. Col. Francis E. Quinlan, chapter president, by Maj. Gen. Gordon A. Blake, Director of Communications, USAF, as AFCEA Executive Vice President George Dixon looks on. The ceremony took place at a meeting at Eglin AFB on March 15th.

Paris

The chapter's February 7th meeting at Le Cercle Militaire was marked by a record attendance, which included representatives from Switzerland, Belgium, Netherlands, Germany and France, as well as many U. S. military personnel from nearby installations. Representatives from industry also turned out in record numbers.

Guest speaker was Frank Chevalier of International Automatic Electric Sales Company, Rome, Italy, who delivered an address on teletype switching centers and systems. His lecture was cleverly illustrated with schematic drawings and charts, and the chapter reported that "his engaging delivery made a highly technical subject understandable by the uninitiated as well as instructive and educational for the technical experts."

Prior to the lecture, Paris Chapter President Arian de Goede made formal presentation of the charter of the Geneva Sub-Chapter to John H. Gayer, president of the sub-chapter, who predicted that it would soon grow large enough to become an independent chapter.

Philadelphia

Dr. Gordon Raisbeck of the Bell Telephone Laboratories, Inc., lectured on the Bell solar battery at the March 1st dinner-meeting of the Philadelphia Chapter. Detailed report, however, had not been received at headquarters as SIGNAL went to press.

Commodore E. M. Webster, USCG (Ret.), chairman of the Federal Communications Commission, addresses the January meeting of the New York Chapter. At his right are George Bailey, AFCEA National President, Vice Admiral W. S. Anderson, past president of the chapter, and, on his left, Col. A. E. Wharton, chapter president.

Pittsburgh

Chapter activities during the first quarter featured tours of nearby industrial plants.

The Jones and Laughlin Steel Company plant was visited on January 27th, and the Continental Can Company on March 31st. Detailed reports, however, had not been received at AFCEA headquarters as SIGNAL went to press.

Sacramento

The chapter, which has been inactive in recent months, has undergone a reorganization and is now conducting regular activities under the leadership of President Milton G. Mauer who also headed the chapter in 1949 and 1950.

Other chapter officers are: vice presidents—Brig. Gen. A. M. Shearer, USA (Ret.), Col. Joseph J. Healy, USA (Ret.), and John R. Wilson; secretary-treasurer—C. A. House; Army counsel—Col. Stuart M. Welsh; Air Force counsel—Lt. Col. Harry G. Dalton; Navy counsel—Cdr. William J. English.

Directors are: Brig. Gen. Clarence P. Talbot, USAF (Ret.), Col. Sidney N. Storbraaten, USA (Ret.), Lt. Col. William J. Hilke, Lamonte J. Brundige, Robert O. McCurry and C. A. Bairos.

A dinner-meeting was held at the Post Restaurant of the Sacramento Signal Depot on March 21st and was addressed by Charles A. Scarlott, manager of technical information services at Stanford Research Institute. More than one hundred members and guests turned out for the occasion.

Mr. Scarlott spoke on solar energy and its application to useful work for the heating and cooling of homes and other structures, heating of domestic water supply, the design and fabrication of solar-operated pumps, and solar stills for distillation of salt water.

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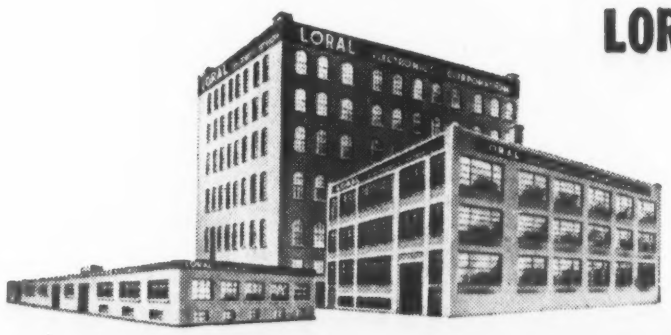

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LORAL ELECTRONICS CORPORATION

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New officers of the Sacramento Chapter shown at a recent meeting. Front row, l to r: Col. S. M. Welsh, Army counsel; Brig. Gen. Clarence P. Talbot, director; Brig. Gen. A. M. Shearer, vice president; Col. S. N. Storbraaten, director; and John R. Wilson, vice president. Back row, l to r: Col. Milton G. Mauer, president, and C. A. House, secretary-treasurer.

San Juan

A dinner meeting was held at the Officers Club, Fort Brooke, on January 27th, with thirty-four members in attendance.

During the business session, numerous items of chapter business were discussed. Among them were replies received from the United Nations, the National Broadcasting Company and AFCEA headquarters concerning the chapter project to aid the blind by means of special electronic equipment.

Two Army information films were shown at the conclusion of the meeting.

Scott-St. Louis

"The Railroad and its Communications System" was the subject of an address by Larry Verberg, Communications Superintendent, Missouri Pacific Lines, at the February 4th dinner-meeting. He was introduced to the gathering by Ernest Hardwig, Superintendent of the Alton and Southern Railroad.

The speaker pointed out that railroad communications present a variety of requirements and that telephone, telegraph, teletype, carrier telephone and radio are all used—each for its best features in various applications. He reported that an interesting development has been the "super" intercom of hundreds of watts of audio power for freight yards and depots. Mr. Verberg also said that radio has been used since 1945 for caboose-to-engine, train-to-train, point-to-point and sometimes base-to-base communication.

Mr. Verberg described, with considerable humor, the requirements for ruggedness of railroad radio equipment, recalling that in early days he had shovelled parts out of equipment cases. He concluded his talk by showing a sound-film strip developed for educating the 10,000 trainmen of his railroad on the use of radio.

Seattle

Guest speaker at the February 9th meeting was Bert Ginigar, flight test project engineer, jet transports, Boeing Airplane Company, who presented a talk and film on the Boeing 707 jet tanker-transport.

Mr. Ginigar pointed out the general characteristics of jets, the problems involved and their advantages for transport use. The film showed the initial flight of the 707 currently being tested in the Seattle area.

The dinner-meeting took place at the Seattle Elks Club and was presided over by Vice President Ray Laine. An added feature on the program was a U. S. Treasury color scenic film, "America the Beautiful."

Interference from flexible coaxial cables was the subject of the March 9th meeting, with Jack Cozine of the Signal Equipment Company handling the program.

Mr. Cozine discussed investigations carried on by his company on a government contract. He reported it was found that such interference, due to circulating currents generated on the outer surface of the shield as a result of discontinuities in the shield, is of sufficient magnitude to cause difficulty when cables carrying high and low signal levels are in close proximity. He demonstrated the equipment and devices used in making measurements of the interference, and also gave conclusions as to possible methods of reducing such interference through redesign of cable shielding.

During the business session, the forthcoming membership drive was discussed and a goal of 100 members was set for September 1st.

Southern Connecticut

Mr. A. E. Diem, vice president in charge of manufacturing, Dictaphone Corporation, gave an outstanding talk on "Communicating with Employees" at the February 17th chapter meeting. Mr. Diem, who is well known as a speaker on affairs of industry, management and religion before employee, management, university and church groups, highlighted his principal points with illustrative anecdotes taken from his wide experience in human relations.

Mr. Diem set forth the premises that (1) even without losing control, one can manage effectively only with the "consent" of employees and associates; and that (2) employee cooperation must be earned by management.

Principles of "Communicating with Employees" developed by the speaker included: (a) employees should know all there is to know about the business operation—there should be no secrets, except salaries of others and new product development; (b) everything stated and done must be truthful; (c) whatever is done must be from the heart

Railroad communications were featured at the February 4th meeting of the Scott-St. Louis Chapter. Appearing below, l to r, are: Lt. Col. John H. Kucera, air conditioning engineer, Missouri Pacific Lines; Larry Verberg, communications superintendent, Alton and Southern Missouri Pacific Lines; Larry Verberg, communications superintendent, Missouri Pacific Lines, guest speaker; and Ernest Hardwig, superintendent, Alton and Southern Railroad.

and with sincerity, not for effect; (d) one should never be against something per se, unless for something better; (e) "Communicating with Employees" should not be delegated to high power specialists but is a continuous responsibility of each and every individual in management.

An additional point voiced was that profits of a business are for the purpose of serving the people—not that people are needed for profits. Mr. Diem's talk held the complete interest of all present and prompted considerable discussion and comment.

Col. T. L. Bartlett, AFCEA Regional Vice President, reported on association affairs and urged maximum attendance at the annual convention in May.

Southern Virginia

Featured speaker at the chapter's March 18th meeting was H. F. Harvey, Jr., electrical engineer and Chairman of the Research Board of the Newport News Shipbuilding and Drydock Company. The meeting was held in the Williamsburg Room of the Langley Air Force Base Officers' Club, with eighty-seven members and guests present.

Mr. Harvey described the various communications, electronics and signaling systems of the *USS United States* and then presented a color film covering the construction of the ship from the laying of the keel to the sea trials.

Chairman of the meeting was Col. J. A. Plihal, first vice president of the chapter.

South Texas

Two Philco Corporation representatives conducted the program of the January 19th meeting at the Fourth Army Officers Club.

Dick House covered the use of universally developed training aids for electronics instruction, giving a very interesting demonstration of a system developed by Philco for training their technicians, and later adopted by the Armed Forces. Richard Fay then continued with a description and an on-the-shop demonstration of an exceptionally compact closed circuit industrial TV system, expounding upon its present and future applications.

Distinguished guests were introduced by Col. Francis B. Morgan, chapter vice president, as follows: Brig. Gen. Stuart Smith, Commanding General, Brooke Army Hospital; Col. Edward J. McNally, Chief of Staff, Fourth Army; and Col. Charles H. Valentine, Asst. Chief of Staff, G-3, Fourth Army.

The February 1st meeting was held in Studio A of the WOAI-TV and Radio Station Building, San Antonio, and was followed by a conducted tour of the facilities.

Justin Duncan, Public Relations Manager, gave a brief talk on the history of both WOIA radio and television stations and described the facilities available. He was followed by Charles Jeffers, Director of Engineering, who outlined the order in which the tour would progress and explained some of the technical aspects of the operations and equipment that would be seen.

The tour covered the studios, studio equipment, control rooms, transmitting equipment and accessory facilities. Messrs. Duncan and Jeffers conducted the tour and explained the various operations as the tour progressed.

Major General Victor A. Conrad, Commanding General of The Signal School and Fort Monmouth, was guest speaker at the chapter's annual meeting on March 2nd at the Seven Oaks Country Club, San Antonio.

General Conrad gave a very enlightening and interesting talk on The Signal School and Fort Monmouth, its mission and history, making all present keenly aware of the potential of the installation and the part it plays in Army communications today.

Annual elections were held with Howard H. Davenport, Military Activities Engineer, Southwestern Bell Telephone Company, chosen to head the chapter for the coming year. The other new officers are: vice presidents—Col. Francis B. Morgan, command communications officer, USAF Security Service; E. S. C. Coppock, investment counselor and president, San Antonio Camera Club; Otto E. Koecher, chief engineer, Signal Section, Fourth Army; secretary—Paul Ross Irwin, president, Audiphone Company of South Texas; treasurer—Maj. Osborne P. Combel. post signal officer, Fort Sam Houston.

Directors are: Maj. Gen. Harold H. Bassett, commanding general, Air Force Security Service; Col. Harold Hughes, group commander, AACS, Randolph Air Force Base; Col. George L. Richon, signal officer, Fourth Army, AFCEA Regional Vice President and retiring chapter president; T. G. Brown, Jr., division manager, Southwestern Bell Telephone Co.; and Morris G. McGee, superintendent, Western Union Telegraph Co.

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Maj. Gen. Victor A. Conrad, Commanding General, Fort Monmouth, is shown addressing the annual meeting of the South Texas Chapter on March 2nd. General Conrad was in San Antonio to represent the Chief Signal Officer at the anniversary celebration at Fort Sam Houston of the first flight of a U. S. Government aircraft by an Army pilot, Lt. Benjamin D. Foulois, Signal Corps, on March 2, 1910.

Tinker-Oklahoma City

For their February 25th meeting, chapter members were guests of fellow member Jack Grewell, CAA, Chief of the Air Traffic Control School at Will Rogers Airfield.

Guided tours were provided through the Air Traffic Control School, Communications Training and Simulator Trainer Aircraft Cockpits of the C-97 and T-33 type aircraft.

Tokyo

The chapter held a luncheon meeting at the FEAMCOM Officers' Club, FEAMCOM Air Base, Tachikawa, on February 10th, which was followed by a tour of the FEALOGFOR Communication-Electronics repair shops and the mobile AACS Base NAVAID system. Attendance totaled one hundred and sixty.

After luncheon, Col. J. K. Schloss, acting as emcee, opened the program by introducing the special guest speakers: Gen. Paul E. Ruestow, Commander, Far East Air Logistic Force, and Gen. William T. Hudnell, Vice Commander, Far East Air Logistic Force. He also introduced Brig. Gen. A. F. Cassevant, USA, Col. Charles J. Harrison, USAF, and Preston Shivers, Philco Corp., all chapter vice presidents, and Col. David P. Gibbs, USA. All speakers welcomed the members and guests and were gratified in seeing such a fine turnout.

Col. Philip A. Gugliotta, USAF, explained the details of the tour scheduled for the afternoon. Capt. Francois Jordan, chapter president, presided over the business meeting and expressed pleasure over the growing number of civilian members in the chapter.

Washington

Civil Aeronautics Administrator Frederick B. Lee addressed the March 2nd luncheon meeting at the National Press Club and pointed out the reciprocating contributions of communications and aviation.

The aviation industry is one of the largest users of communications facilities in the country and CAA is one of the largest communications agencies, Mr. Lee stated. Communications and electronics equipment, he said, is coming into greater use in the field of aviation both because of the tremendous increase in passenger miles and also the higher speeds of craft requiring equipment to assure the utmost safety.

Mr. Lee also commented that, at the same time, aviation has contributed to communications by stimulating development in the field, pointing particularly to the radiotelephone and the expanded use of higher frequencies.

The meeting was also the occasion of a chapter tribute to Rear Admiral William B. Ammon, Director of Naval Communications, who was being transferred to Atlantic Fleet duty. Admiral and Mrs. Ammon were honor guests at the head table.

Program chairman of the meeting was William J. McManus, Vice President of the Chesapeake & Potomac Telephone Company.

On March 25th, the chapter gave a testimonal dinner at the Hotel Shoreham in honor of Major General George I. Back, retiring Chief Signal Officer of the Army, and his successor, Major General James D. O'Connell.

The Honorable George H. Roderick, Assistant Secretary of the Army for Civil-Military Affairs, made the principal address in which he ably defined the mission and accomplishments of the AFCEA in maintaining a close partnership on the highest level between the Armed Forces and the leaders of the communications and electronics industries so vital to national defense.

Col. Frank W. Wozencraft, chapter president, acted as master of ceremonies. Among the 550 in attendance were National President George W. Bailey and four former national presidents of the association: W. Walter Watts, William J. Halligan, Joseph R. Redman and Frederick R. Lack. Also present were representatives from AFCEA chapters throughout the country, and the Washington Chapter extends to all chapter presidents its appreciation for their splendid cooperation in making the occasion such an outstanding success.

Student Chapters

Iowa State College

Chapter meetings are being held biweekly at the present time in order to arouse interest and increase membership. The results of this policy have been encouraging.

Programs have consisted primarily of films on a variety of subjects obtained by Lt. Col. William T. Hartman, faculty advisor. Plans are now underway to schedule several speakers in the electronics and communications fields for future programs.

Present chapter officers are as follows: president—Richard L. Wegman; vice-president—Thomas F. Moehl; secretary—Robert V. Donaldson; treasurer—Charles J. Ong.

New York University

The chapter has been reorganized and new officers have been elected. They are: president—Walter Hoelderich; vice-president—Charles Von-Urff; secretary—Bert Helfinstein; treasurer—Harold Cooley.

Captain William B. Landry, Signal Corps Assistant PMST, is faculty advisor and is assisting the chapter in all activities.

Washington Chapter testimonial dinner at the Shoreham Hotel. At the head table were: George W. Bailey, National President; Mrs. Dixon; Capt. Garrett Van A. Graves, Chief of Communications, USCG; Mrs. Caswell; Brig. Gen. Frank A. Tobey, Deputy Chief of Chaplains, U. S. Army; Mrs. Blake; Maj. Gen. R. V. D. Corput, Jr., Chairman, JCEC; Mrs. Lanahan; Maj. Gen. Spencer B. Akin, USA (Ret)., former Chief Signal Officer; Mrs. OConnell; Maj. Gen. George I. Back; Chief Signal Officer; Mrs. Roderick; Col. Frank W. Wozencraft, chapter president; Mrs. Back; the Honorable George H. Roderick, Assistant Secretary of the Army; Mrs. Wozencraft; Maj. Gen. James D. O'Connell, Deputy Chief Signal Officer; Mrs. Akin; Maj. Gen. Francis H. Lanahan, then Assistant Deputy Chief of Staff for Logistics; Mrs. Corput; Maj. Gen. Gordon A. Blake, Director of Communications, USAF; Mrs. Tobey; Capt. Gordon L. Caswell, Acting Director of Naval Communications; Mrs. Graves; and Col. George P. Dixon, Executive Vice President.

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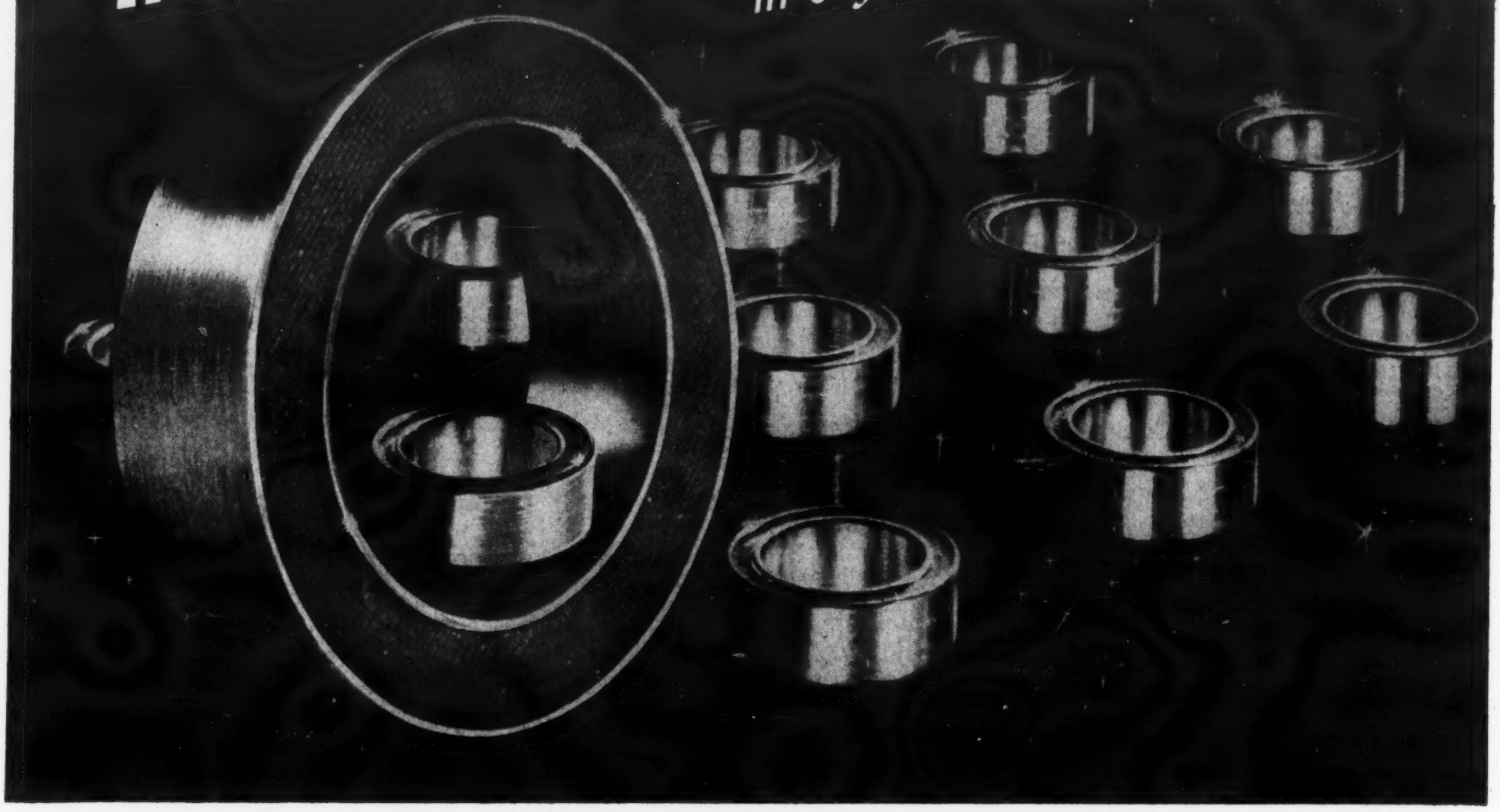

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Systems Management at PHILCO

by James D. McLean

Vice President, Philco Corporation
Government and Industrial Division

WE FOUND IN THE DEFINITIONS OF *Systems* and *Management* these key objectives for a producer of electronic and electro-mechanical equipment: "*Systems* are assemblages of units designed to perform in unison and in obedience to certain forms of control"; while "*Management* is the skillful direction and control of forces to accomplish specific ends". Taken singularly, these are thoughts of great significance; united, they become a motivating force for coordination of action in our organization from the top down.

It was the harnessing of these two powerful thoughts that we of the Government and Industrial ("G&I") Division of Philco envisioned when we first coined our Systems Management philosophy. It was evident that this philosophy should be instituted not only in the design and manufacture of equipment, but also could and should be applied as a methodical way of "thinking and doing" as well. There was to follow then the projection of this concept far into the various branches of Philco research, design engineering, manufacture and field service.

Systems Management involves a look into the past—into the shortcomings and inadequacies of previous equipments. It also commands creative thinking about the future—what is good today may not be adequate tomorrow. So it demands a knowledge of current scientific developments and how they can be fit into future requirements.

Systems Management was inspired by the military. We learned early in the arms production era over a decade ago that our Armed Forces needed, almost more than anything else, to reduce the endless flow of outmoded and unrelated "black boxes" of military electronic equipment, and to supplant them with compact, practical and integrated systems. Of necessity these systems had to be designed to perform specified functions, and perform them well under adverse conditions, with utmost simplicity and reliability.

Coupled to this was the usual military need for designs adapted to efficient manufacture and ease of maintenance. The practice of modifying earlier units of equipment to fit them into newly designed systems seldom could keep pace with rapid advancements made in the weapons in which they were to be used. This practice often produced awkward and unduly complicated systems, difficult to manufacture in quantity and complex to operate in the field.

Today's military requirements place heavy emphasis on mechanical

Complete automation and communication system designed by Philco. Pictured below is the control center of the 1000-mile Platte Pipe Line system, almost completely operated by Philco microwave.

Philco adds final touches to airborne radar produced for patrol bombers.

Part of the automatic machinery developed by Philco for producing Philco "Surface Barrier" transistors in quantity.

and electronic knowledge, experience and skill. Our modern research facilities and heavily staffed mechanical and electronic design engineering departments are strong pinnacles of Philco's effective Systems Management team. Philco research laboratories are among the largest in the country today. Approximately 2000 scientists, engineers and technicians are engaged in research and development work for the Government and various civilian programs. The contributions made by these scientists have been a major significance in many fields, including communications, radar, guided missiles, fire control and components such as tubes, crystal diodes and transistors.

A precision land and sea target bombing system is one of our many engineering and production contributions to fill the military requirement for integrated systems. This is a complete and highly automatic equipment, which practically eliminates error in the solution of bombing problems, and also relaxes the stringent requirements of the pilot and operator during the bombing run.

Further in development and production, the Department of Defense has announced our contract for the air-to-air guided missile known as the "Sidewinder". This missile, a Philco development, has proved effective in recent tests, and introduces a new economy in the design of missiles. We also contributed in large measure to the development and production of a portion of the "Terrier" missile.

In the field of research, an entirely new concept of linking transistors in a miniature "electronic brain"—or computer—called the "TRANSAC" (transistor automatic computer) was very recently disclosed by our research laboratories. Known as the Philco direct-coupled transistor circuit, the invention presages mass production of transistorized computers, capable of performing 600,000 additions or subtractions a second. Such a computer would operate approximately 10 times as fast, and its size, weight and cost would be about ⅓ that of any previous transistorized computer.

Each year, our Division assumes a more important role in programs of advanced research, engineering and production of electronic and electromechanical systems for the Department of Defense. It is our objective to further diversify these activities in the military electronics field. Through our Systems Management philosophy, which is proving its capability to produce efficient and effective systems, we will continue to concentrate our efforts on the development and production of strategic equipment.

An Annoyed Customer Started the Automatic Dial System!

When Almon Strowger lost his temper in 1889, he found a new telephone system which Automatic Electric has sold around the world.

THE WORLD OWES THE AUTOMATIC telephone to a man who capitalized on his temper. In Kansas City, Missouri, back in 1889, a caller who had some business to transact asked "Central" for Almon Brown Strowger's number. Told the line was busy, he placed his call, and his business elsewhere.

When Strowger, a thin, nervous little man with white whiskers, learned that his line had not been busy at the time, he was greatly provoked. This set him on a course of experimenting that resulted in the invention of an electro-mechanical device for making automatic telephone connections.

The Strowger Automatic Telephone Exchange, predecessor of Automatic Electric Company, was formed and the first automatic telephones were installed at La Porte, Indiana in 1892.

In this first system, push buttons were used to send impulses of current, causing a central office switch to select the called line. To call number 89, for instance, the user pushed the first button on his telephone eight times, and a second button nine times, with the mechanism moving over the line terminals at each push of the button until the called line was reached without an operator.

Mistakes were easy to make while pushing buttons the correct number of times, so to make telephone service more accurate and convenient, as well as faster, Strowger engineers developed the first automatic dial and placed it in service at Albion, New York in 1896.

The first Stromberg dial, front and rear view, developed in 1895 and placed in use at Albion, New York in 1896.

From this beginning came a succession of pioneering achievements that had a profound impact on global communications: Automatic paystations in 1905, operator toll dialing beginning in 1910, the "Director" in 1920 that automatically selects alternate routes for calls when direct route trunks are busy, the popular monophone handset in 1925, a nationwide toll ticketing system for the Belgian Government in 1938, followed in 1944 by a system designed for United States use installed at Santa Monica, California, the new Type 80 Monophone with the "walking handset" in 1954; these and many, many other developments helped spread the world-wide popularity of Automatic Electric products.

Use of the automatic telephone, which had been increasing among In-

The automatic dial telephone of 1898, similar to the Strowger model installed at the White House during the Spanish-American war.

dependent telephone companies since 1892, got a big boost in 1918 when the Bell System placed its first order for automatic dial equipment, an 11,000-line Automatic Electric exchange at Norfolk, Virginia.

Foreign use of Strowger equipment began with the introduction of a 200-line system in London in 1898, and a 400-line system in Berlin in 1899. These were soon followed by installations elsewhere in Europe, South Africa, Canada, Cuba, South America, Australia, New Zealand and the Orient.

Today, both in the United States and through the world, Strowger-

Automatic Electric's new Type 80 Monophone with the "walking handset." Contours of the housing, and balance of the handset, were redesigned so that no matter how carelessly the handset is replaced, it automatically settles back into the telephone cradle.

ALL AMERICAN CABLES & RADIO, INC. DOUGLAS AIRCRAFT CO. TRANS-CANADA AIR LINES
CANADAIR LIMITED CANADIAN PACIFIC AIR LINES LTD. FLORIDA POWER & LIGHT CO.
GLENN L. MARTIN COMPANY
TRANS-WORLD AIRLINES
BELL AIRCRAFT CORP.
These are just 15 of the many leading companies who upgrade their engineering and technical personnel with group training provided by CREI (founded 1927). CREI is seen each year at our IRE Convention Booth, and is a group member of the AFCEA. Approximately 1/3 of CREI students during our 28 years are commissioned and enlisted e'ectronics oersonnel in the Armed Forces.
RADIO CORPORATION OF AMERICA
PAN AMERICAN AIRWAYS (ATLANTIC DIV.)
UNITED AIR LINES COLUMBIA BROADCASTING SYSTEM NATIONAL BROADCASTING CO.
CANADIAN BROADCASTING CORP.

Shortage of Engineering Personnel?

We'll help you upgrade from within

TODAY'S recruiting efforts hardly help ease today's shortage. But, what about the future? The scarcity shows no signs of letting up.

We can help solve your *present* and *future* problems with CREI Group Training. This is the method many leading companies are using successfully to upgrade their engineering and technical personnel *from within.*

Among the group training enrollees with CREI are:

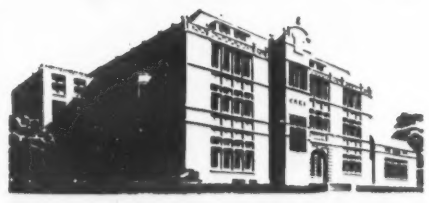
- 20% of the electronic staff of a leading aviation manufacturing company.
- More than 300 members of a leading airline's technical staff.
- Hundreds of others, employed by leading manufacturers and research laboratories. There are now approximately 10,000 active CREI students employed professionally in the electronics industry.

CREI's instruction material is prepared and administered in a personalized style by engineers who know how to teach and who know the requirements of the electronics industry.

Whether yours is a large company, or small, let us show you how CREI group training is working for others . . . how to set up a program that works . . . and how CREI can help you prepare for tomorrow's continuing shortages by "developing your own."

Write, or phone, directly to: E. A. Corey, Registrar.

Capitol Radio Engineering Institute



ECPD Accredited Technical Institute Curricula
3224-16th Street, N.W., Dept. 195 B, HObart 2-1520
Washington 10, D. C.

type equipment serves more than twice as many telephones as any other automatic system.

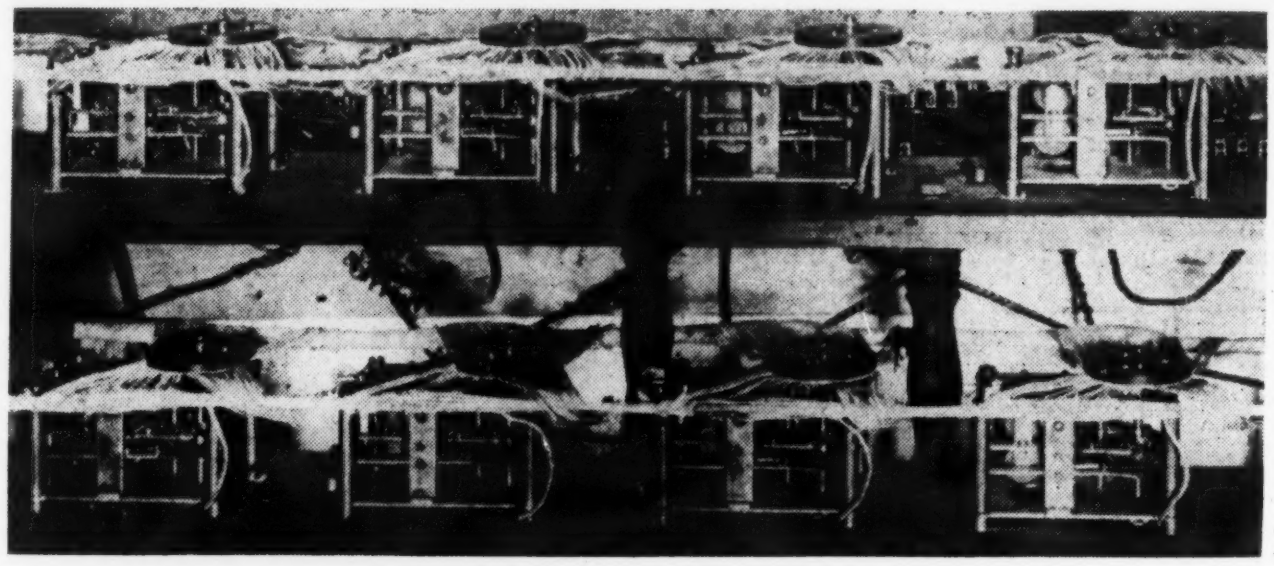
Since the installation of an automatic switching system at Fort Sheridan, Illinois in 1893, and at the White House during the Spanish-American War, Automatic Electric has continued to provide our air, sea and ground forces, and many other government agencies with new and improved communication and electrical control equipment. Typical is the recently announced fully automatic Shipboard Dial System designed especially for use on the Navy's Super Carriers.

The 400-line unit now being installed on the world's largest warship, the USS *Forrestal,* provides rapid, automatic telephone service between various points on the vessel. Acoustical properties of the desk-type, bulk-head and splash-proof weather deck telephones have high voice fidelity in heavy noise situations, dials with soft-glow lighting devices so that calls can be made when ships are darkened, special locking devices to keep handsets on the hook when the ship is rolling, and a right-of-way feature so that high priority calls can be cut in on any existing conversation.

Another notable development is teletypewriter switching. By 1952, Automatic Electric had designed and installed the first fully automatic Teletypewriter Switch Center for the Signal Corps at Fifth Army Headquarters in Chicago.

This system and the larger units now in production, provide more rapid delivery of messages, greater utilization of lines, and increased economy due to a substantial reduction in the number of personnel required to handle traffic.

Pictured here is the Strowger installation at Augusta, Georgia, in 1897, the first use of switches for automatic trunk line selection. These group choosing selectors made possible a system composed of ranks of switches, which not only paved the way for flexible trunking, but also gave birth to the principle of "small-unit" design which has been largely responsible for the wide-spread use of the Strowger system.



A bank of Strowger switches in the first military installation at Fort Sheridan, Illinois, in 1893.

The new splash-proof weather deck telephone designed by Automatic Electric for installation aboard the USS Forrestal, the world's largest warship.

Automatic Electric communication equipment is in use at Air Force bases and installations throughout the world, and relays, stepping switches and other specialized devices have many important uses in aircraft and airways control.

The increasing use of Automatic Electric products by Independent Telephone Companies and industry in the United States, by the Armed Forces and other Government agencies, and by telephone administrations abroad, is served by a world-wide organization. Factories are located at Chicago, Illinois; Brockville, Canada; Antwerp, Belgium and Milan, Italy. Sales and service offices are in principal cities of the United States and foreign countries.

● Some 750 workers and inspectors who assemble G-E 5-Star high-reliability tubes, wear white lint-free nylon uniforms. The entire working area—a small part of which is shown here—is pressurized with filtered air, to keep out dust. Employees, before entering, walk over gratings through which powerful suction removes dust from shoes.

G-E "Operation Snow White" brings clinical cleanliness to manufacture of 5-Star Tubes!

LINT, dust, and other impurities can cause intermittent tube shorts, because of the close spacing between internal elements. Consequently, dust-free conditions are essential during assembly, to assure the dependability of 5-Star Tubes in military applications.

A dozen advancements join to make possible "Operation Snow White" in G.E.'s Owensboro, Ky., tube plant. Besides the dust-prevention methods shown above, floors are continuously vacuum-cleaned, and mounting tables and conveyors are wiped down twice daily. No outer garments can be brought into the working area, and lunches there are forbidden. Traffic into the area is rigidly controlled. Still other steps feature G.E.'s effort to create factory conditions of unparalleled cleanliness.

Manufactured by a specially-trained employee staff, in a building apart from the rest of the G-E tube plant . . . assembled and inspected in lint-free, dust-free surroundings . . . 5-Star Tubes are the most reliable electronic tubes you can obtain. Ask for them in new land-sea-air military equipment! Install them as replacements! *General Electric Company, Tube Department, Schenectady 5, New York.*

Progress Is Our Most Important Product

GENERAL ELECTRIC

164-1A3

Hoffman develops new

Antenna Multicoupler System

HOFFMAN LABORATORIES, INC. BEGAN PRODUCING electronic equipment shortly after Pearl Harbor. During this early period Hoffman produced thousands of box kites which were used to carry aloft the antenna for the famous Gibson-girl air-sea rescue unit. This simple application of electronics is quite a contrast to the company's present production in all phases of communications as well as electronic gear used in fire control. direction finding and navigation.

Hoffman Laboratories has been particularly active in the antenna multicoupler field for the past several years. Sizeable contracts for the production of series-type CU-255/UR and CU-322/UR UHF antenna multicouplers have been successfully completed for the military. The CU-255 is automatically tuned while the CU-322 is its manually tuned counterpart. Each unit measures approximately 5 by 6 by 68 inches and weighs approximately 100 pounds. An antenna multicoupler system is formed when four of these units are connected in series to a common antenna.

Shown below is Hoffman Laboratories' Model 218-M UHF antenna multicoupler, the smallest 4-channel, manually tuned UHF multicoupler of the parallel type yet developed.

Hoffman Laboratories has recently completed its o
Model 218-M—the smallest 4-channel, manually tun
UHF antenna multicoupler of the parallel type yet
veloped. The entire 4-channel multicoupler measures o
12 by 12 inches and extends a mere 14 inches behin
19-inch relay-rack panel. Weighing approximately
pounds, the 218-M is readily adaptable to single-contr
automatic operation. It covers a frequency range of 2
to 400 megacycles and can be extended to 215 megacyc
with minor modifications.

In addition to reduction in cost, size, weight and m
chanical complexity over earlier production units, Ho
man Laboratories' Model 218-M UHF antenna mul
coupler offers additional distinguishing and useful fe
tures. No calibration charts are necessary with the 21
M's straight-line, frequency calibration in which a m
chanical counter is used to directly indicate the opera
ing frequency. The bandwidth is independent of t
operating frequency and a constant 3.2 megacycle mi
mum channel separation is automatically maintain
over the entire 225 to 400 megacycle operating rang
No adjustment other than tuning to resonance is require

The features of the Hoffman 218-M model are innov
tions in the UHF multicoupler field. Each characterist
was accomplished without reduction in the high efficien
that is required in a well designed UHF multicouple
The maximum insertion loss is less than one decibel
the extremes of environmental operating conditions. wi
nominal losses of approximately 0.7 decibel. Sufficie
engineering data has been obtained to permit the rapi
development of similar antenna multicouplers with var
ing channel separation and corresponding insertion losse

The development by Hoffman Laboratories of such pr
prietary items as the Model 218-M UHF antenna mult
coupler is only one example of the company's leadershi
in electronics. A number of patented circuits for a
types of receivers, transmitters and radar equipmen
which eliminate spurious signals and increase sharply th
efficiency of the equipment have also been developed.

When Hoffman Laboratories entered the field of ad
vanced electronics a little more than a decade ago, i
occupied a single building of 5000 square feet. Toda
Hoffman Laboratories occupies three plants with 240,00
square feet of floor space. Each of the three plants i
staffed and equipped to do a highly specialized type o
work. These plants, working individually or in an
needed combination, serve as models to the industry i
their efficiency and elimination of waste motion, duplic

tion or over-lapping of function.

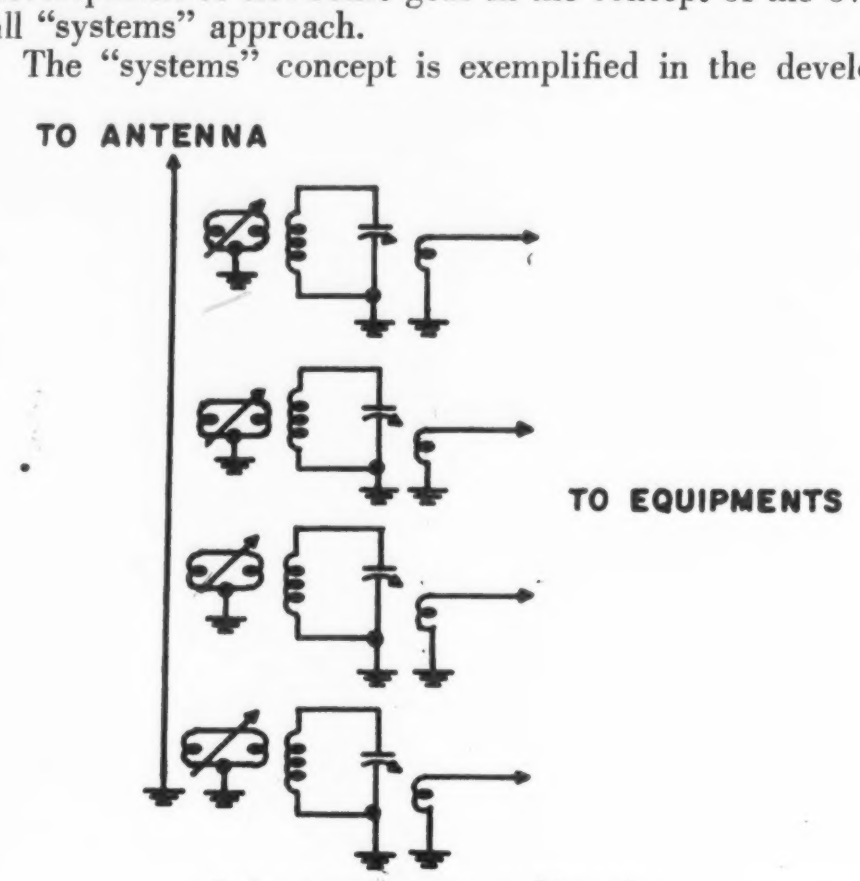
Hoffman Laboratories is staffed and equipped to design, develop, test and manufacture equipment ranging in size from miniature transceivers to heavy shipboard fire control equipments weighing over two tons.

One special products laboratory is currently developing production techniques for printed circuitry. This department has successfully produced electronic equipment with printed circuits and is experimenting with further use of this development plus additional applications. Complete facilities are available for this new technique beginning with photographic equipment through the etching process itself.

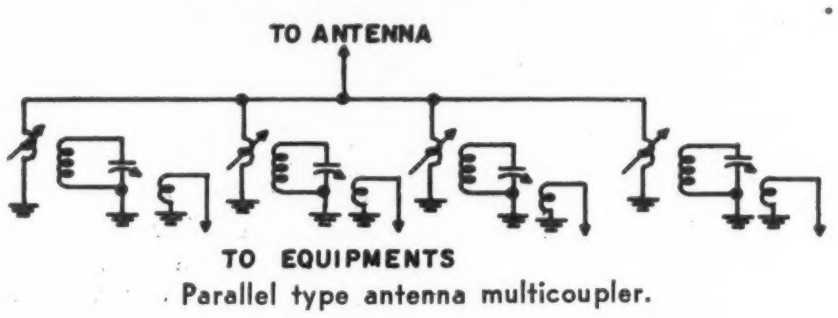
In large measure, the rapid growth and success of Hoffman Laboratories has been the result of unusual ability on the part of its more than 300 engineers in the development of electronic gear in the concept of the overall "systems" approach.

The "systems" concept is exemplified in the development of a guided missile and is the only sound one in designing such an integrated weapon. Problems of aerodynamics, propulsion, guidance, electromechanics, mathematics and hydraulics are all closely related in the design; it is not possible to modify any without thorough consideration of the effects on one or more of the others. Recognition of and allowance for these inter-relationships are a prime requisite in any organization which is to continue in the forefront of the industry.

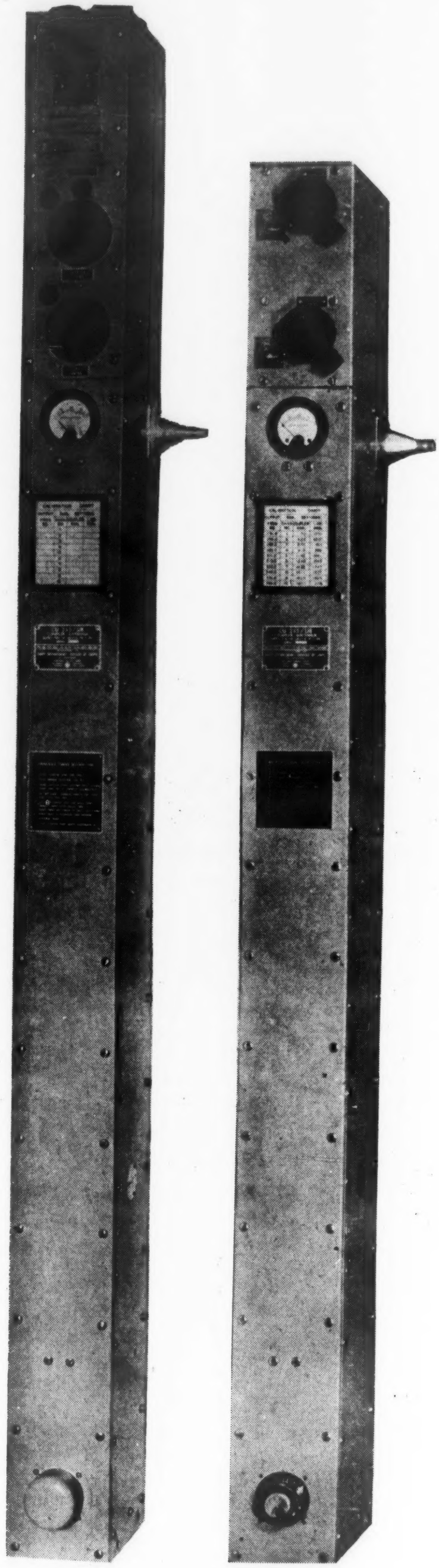
Systems design, engineering and production require specialized personnel who have highly developed technical skills and, more important, have the maturity of outlook to enable them to engage in the cooperative team work with experts in related fields, in order to bring to completion the most complicated mission in electronics research, development and manufacture.



Series type antenna multicoupler.



Parallel type antenna multicoupler.


Production model of series type CU-255/UR (left) and CU-322/UR (right), antenna multicouplers manufactured by the Hoffman Laboratories.

292 to 23,000 Miles

AT&T's 70 years of service have helped to make global distances shrink

WITH THE MONUMENTAL foresight so typical of many pioneers of newborn America, four thoughtful, bewhiskered and waistcoated men penned their names 70 years ago to a document that foreshadowed a breathtaking age—an age in which people could not only speak with each other beyond the areas of a single city, or state, but across the borders of nations and even the hemispheres.

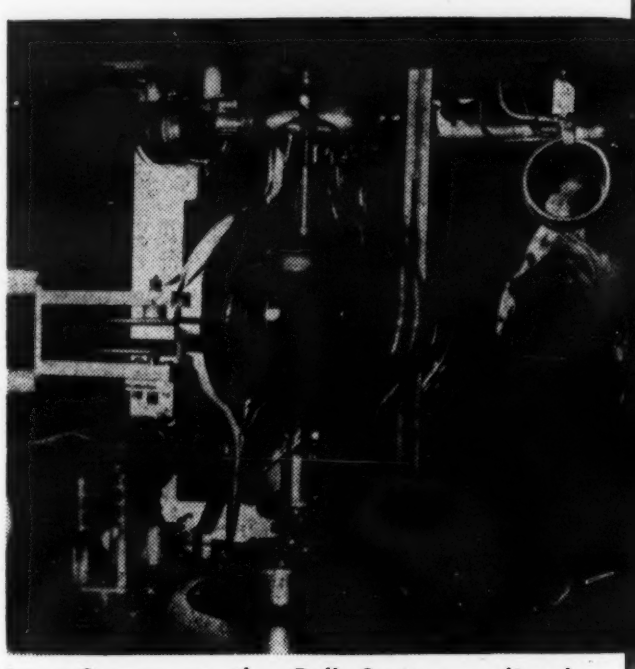
The document, its precise and cadent language neatly filling four elongated pages, contained the Articles of Association of the American Telephone and Telegraph Company. It said in part:

". . . And it is further declared and certified that the general route of the lines of this association, in addition to those herein before described or designated, will connect one or more points in each and every city, town or place in the state of New York with one or more points in each and every other city, town or place in said state, and in each and every other of the United States. and in Canada and Mexico; and each and every of said cities, towns and places is to be connected with each and every other city, town or place in said states and countries, and also by cable and other appropriate means with the rest of the known world as may hereafter become necessary or desirable in conducting the business of this association. . ."

At the time of the historical signing of the "Articles," and their subsequent filing with the State of New York, the longest telephone line in existence extended from Boston to New York a record distance of 292 miles. But A. T. & T.'s charter was most prophetic. For today, Americans are within minutes' reach of almost any telephone on the face of the globe. In the United States, a giant network of radio and wire circuits, owned and operated by the Bell System, makes possible interconnection of more than 52,000,000 telephones. Overseas facilities give U. S. telephone subscribers access to another 38,000,000 telephones located in some 106 foreign territories and countries. They can also speak with ships on the high seas. The number of conversations recorded for 1954, including domestic and international calls, reached the staggering total of 63,885,000,000.

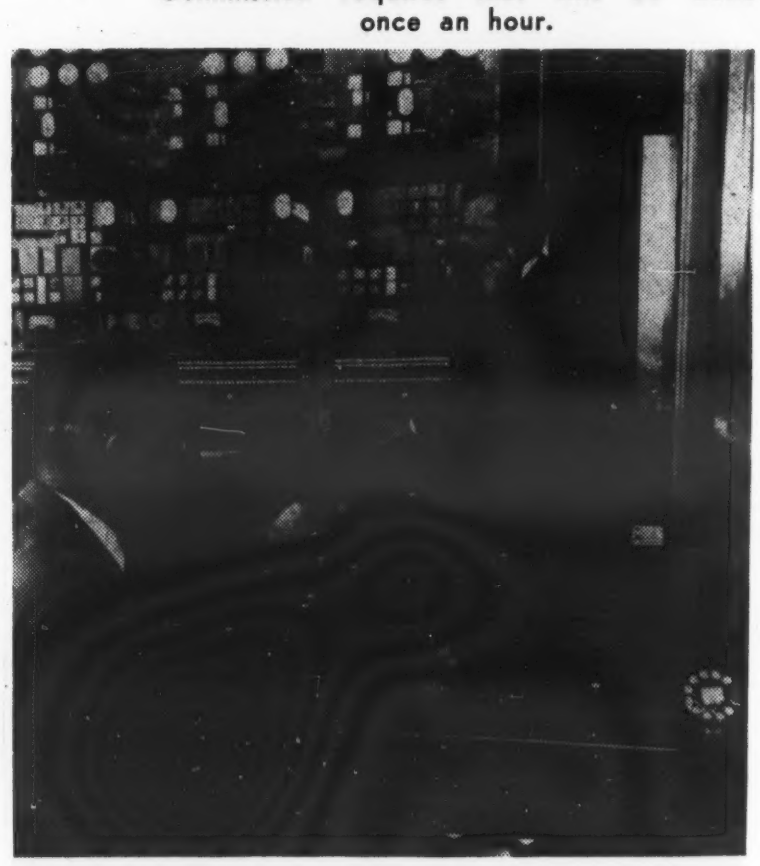
In back of the ease with which the telephone has made the world one's neighbor, lies years of untiring research by scores of skilled Bell System engineers and technicians. Distances were conquered by degrees as new and better means of transmitting speech were explored and perfected.

In 1881, the first international telephone link was established when three pairs of wires in a telegraph cable between Detroit, Mich., and Windsor, Ont., were opened for telephone serv-



A craftsman at the Bell System radiotelephone overseas transmitting station at Lawrenceville, New Jersey, makes an adjustment in one of the high-powered amplifiers where the voice currents are augmented and sent out to the antennas for transmission overseas.

Frequency assignments for overseas radiotelephone service are cleared at coordinator's pegboard in overseas control office at the AT&T Long Lines headquarters building, New York. In the background, a craftsman sends out call letters identifying one of the transmitters. The Federal Communications Commission requires that this be done once an hour.



ice. A second international link was provided in 1883 when circuits were strung across the border into Mexico from Brownsville, Tex.

It was not until 1915, however, when Bell System engineers developed a vacuum tube amplifier for use in a telephone repeater, that a conversation between New York and San Francisco was finally made possible.

The same year that the telephone bridged the continent, the new vacuum tube was used in attempts to span the Atlantic by radio. After weeks of trial, A. T. & T. engineers in the Eiffel Tower in Paris finally heard, faintly, words spoken in Arlington, Virginia. World War I delayed the development of transoceanic telephony and it was not until January 7, 1927, that commercial radiotelephone service was established between New York and London. Soon afterward, overseas connections were established between New York and major cities in Europe, in Africa and Australia.

In December 1931, the Long Lines Department of A. T. & T. opened an overseas terminal in San Francisco. It heralded the beginning of radiotelephone service across the Pacific.

Just a year later, a third overseas terminal was established in Miami, Fla., and subscribers in the United States could speak to points in Central and South America.

History Made in 1935

And, in 1935, 50 years after the original incorporation of A. T. & T., the prophecy of the founding charter was, in principle, fulfilled. On April 25th of that year two men seated in adjoining offices in New York, talked around the world to each other via telephone. They were Walter S. Gifford, then President of A. T. & T., and late T. G. Miller, then Vice President and head of A. T. & T's Long Lines Department.

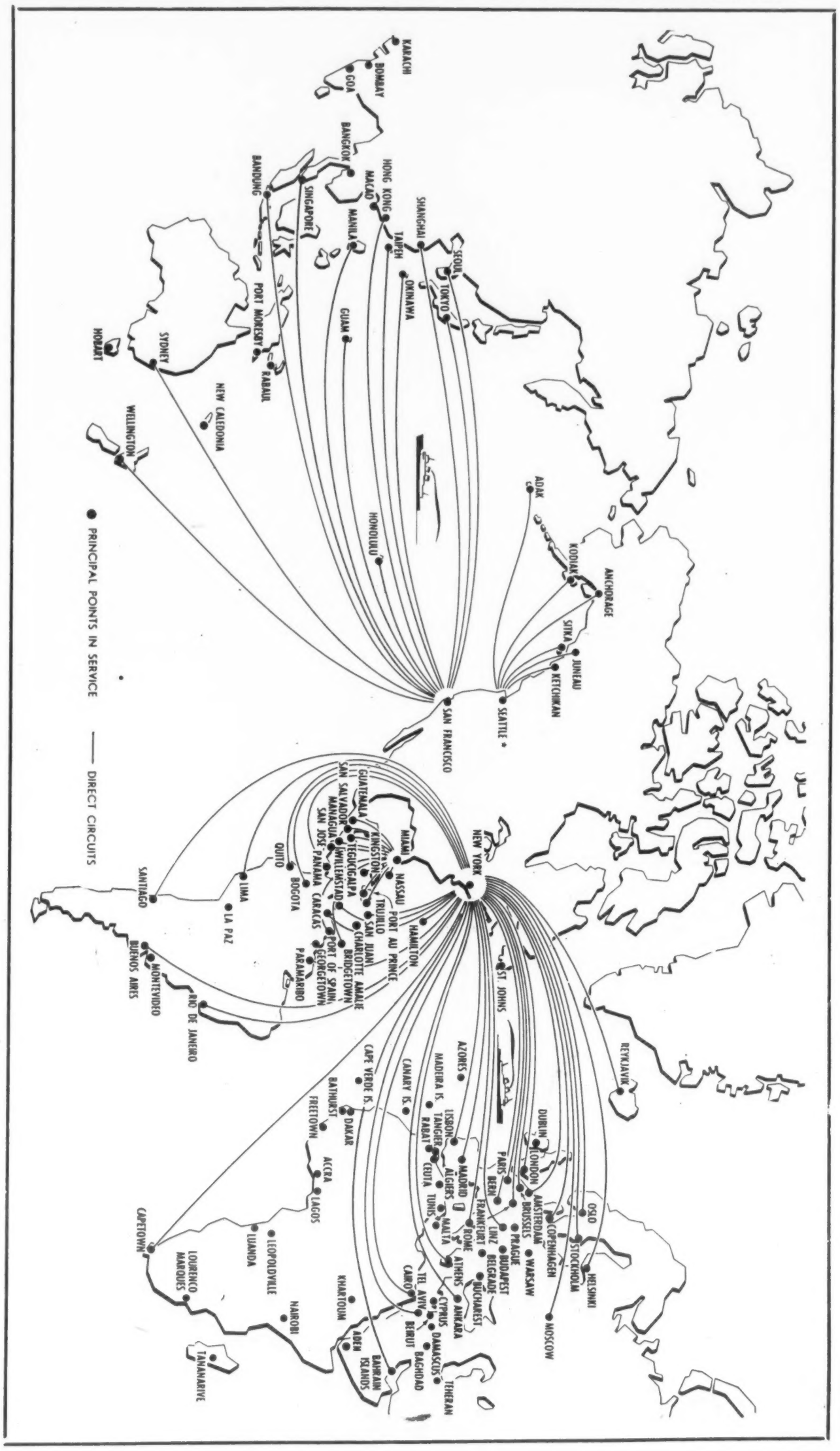
Each word the executives uttered on this momentous occasion made the 23,000-mile journey in just one-quarter of a second. As Mr. Gifford's conversation sped west from New York through San Francisco, Java, Amsterdam, and London, Mr. Miller talked in the opposite direction. Every known type of circuit was used in making this call: underground and aerial cable, open wire, carrier radio and submarine cable.

Today, another of the dreams of Alexander Graham Bell is being realized with the construction of the world's first transoceanic voice cable. The cable, to stretch some 2,000 nautical miles across the Atlantic between Newfoundland and Scotland, will provide direct circuits between New York and London. When it opens for service late in 1956, it will climax more than 25 years of active research by Bell System people.

The shape of the future is glimpsed in other projects coming off the drawing boards—from solar batteries to harness the energy of the sun, to over-the-horizon radio transmission systems to conquer space.

In research, and in service, the men and women of the Bell System continue to reach for new goals—notwithstanding the great strides that have been made in fulfilling the communications prophecy of the 70-year-old "Articles."

Bell system overseas telephone service spans the oceans. Until completion of the Long Lines' Seattle-Ketchikan cable, service with Alaska is furnished over facilities of the U. S. Army Alaska Communications System, interconnected with Bell System facilities at Seattle.



In all communications...

TRAK equipment = added reliability

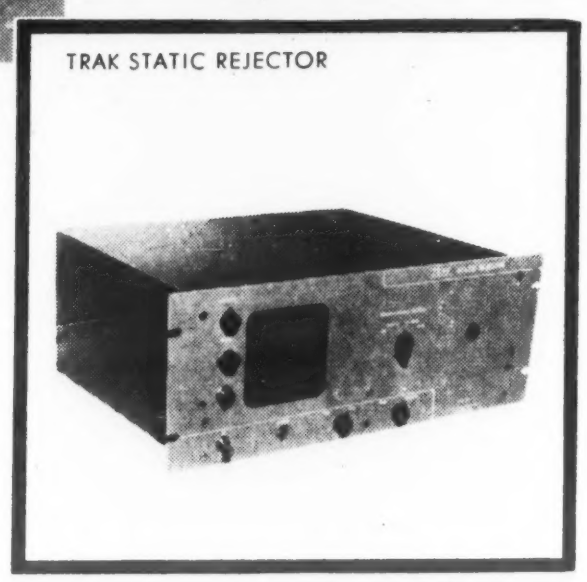
TRAK

If you receive frequency shift signals...

The TRAK Tuning Lock now provides automatic tuning control for any frequency-shift receiver, eliminating tedious hand re-tuning and automatically compensating for drift from any cause. Cuts message losses, minimizes repeats, speeds station routine, and permits round-the-clock operation with fewer operators, less attention and fatigue. The mere addition of the tuning lock will make low-stability receivers perform better than highly stabilized receiving systems.

If you receive International Morse signals...

Only the TRAK Automatic Code Converter provides complete conversion—*without a human operator*—of Morse code to finished message form on printed page copy from a standard teletypewriter. This all-electronic computor accepts Morse signals from any source, receiver, tape, or keyed circuit, and transcribes them perfectly at any speed from 10 to 600 words per minute under sustained operation without attention indefinitely. This remarkable instrument was introduced publicly at the recent Institute of Radio Engineers show in New York City where it received sensational acclaim.



If you receive any code signals...

The TRAK Static Rejector provides a new approach to the problem of signal loss due to man-made interference and atmospheric disturbances. It provides a striking increase in the readability of signals under the most adverse conditions. It eliminates operator fatigue normally caused by reading copy through continual static bursts and irritating background noise. The first models of this revolutionary device are scheduled for July delivery. Meanwhile, ask for a demonstration with your own receiving equipment and hear the difference!

You'll want full details on these revolutionary advances in communications equipment. A request on your letterhead will bring descriptive literature and more information immediately without any obligation.

391 Ludlow Street, Stamford, Connecticut

C.G.S. LABORATORIES, INC.

LEWYT for Speed and Safety

Signal Corps students are introduced to high power transmission through Lewyt-manufactured AN/FRA-2 Amplifier Group. Used in fixed Signal Corps stations throughout the world, the AN/FRA-2 is called "the work horse of the Corps." It is liked by both students and seasoned operators for its ease of operation.

In 1948 the Lewyt Manufacturing Corporation, Brooklyn, New York, received a contract to produce its first Amplifier Group AN/FRA-2 for the Signal Corps. This is a 10 kw, RF Amplifier used to amplify a CW signal over a frequency range of 4 to 26.5 mc. Lewyt manufactured the entire system, including the plate tuning condenser and developed a new type tuning screw that reduced tuning time by half. Today, the AN/FRA-2 is hailed as "the work horse of the Signal Corps."

The AN/FRA-2 consists of the following major components:

1. *Push pull power Amplifier BC-340*—Capable of delivering 10 kw. to a transmission line with a surge impedance of 600 ohms.
2. *Rectifier RA-22*—Supplies the high DC voltage to the amplifier tube plates. It is a three-phase full-wave rectifier unit delivering an output of 3750 to 8350 volts DC at 1.0 amperes.
3. *Water cooling unit RU-2*—A closed circuit type system used to circulate water within vacuum tube water jackets and plate tuning coils to absorb and dissipate heat.

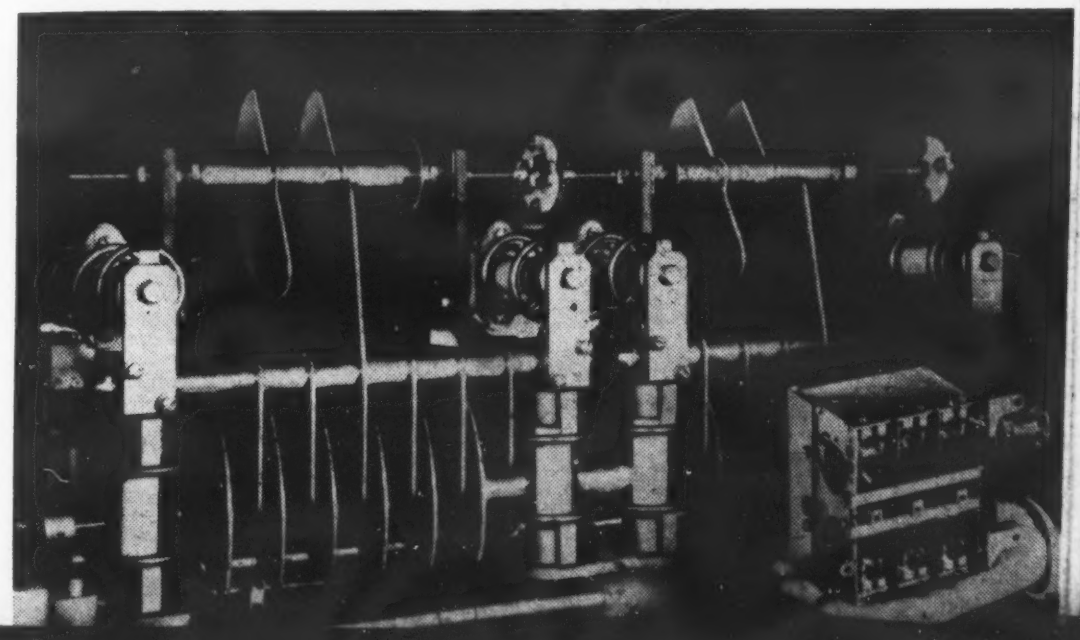
The reliability of the equipment has been established over years of use under extremely adverse conditions, from the Tropics to the Arctic.

At Fort Monmouth, Signal Corps students are constantly being introduced to high power transmission through the AN/FRA-2. The students, as well as seasoned operators, like it for its speed, safety and ease of operation.

A Government contractor since 1914, Lewyt produces a broad variety of mobile communications equipment such as component transmitter receivers of the AN/GRC-3-8 standard series as well as big fixed-station equipment like the AN/FRA-2. Its engineering — from drawing board to finished product—has been responsible for the company's receiving many manufacturing contracts from all branches of the Armed Services.

On the Lewyt-built AN/FRA-2 amplifier group, it is impossible to turn on the power amplifier until the huge water cooling unit shown above is switched on.

Below is a huge Lewyt silver-plated condenser for the power amplifier, measuring 30" x 10" x 10". Shown beside it is a smaller Lewyt-built condenser.



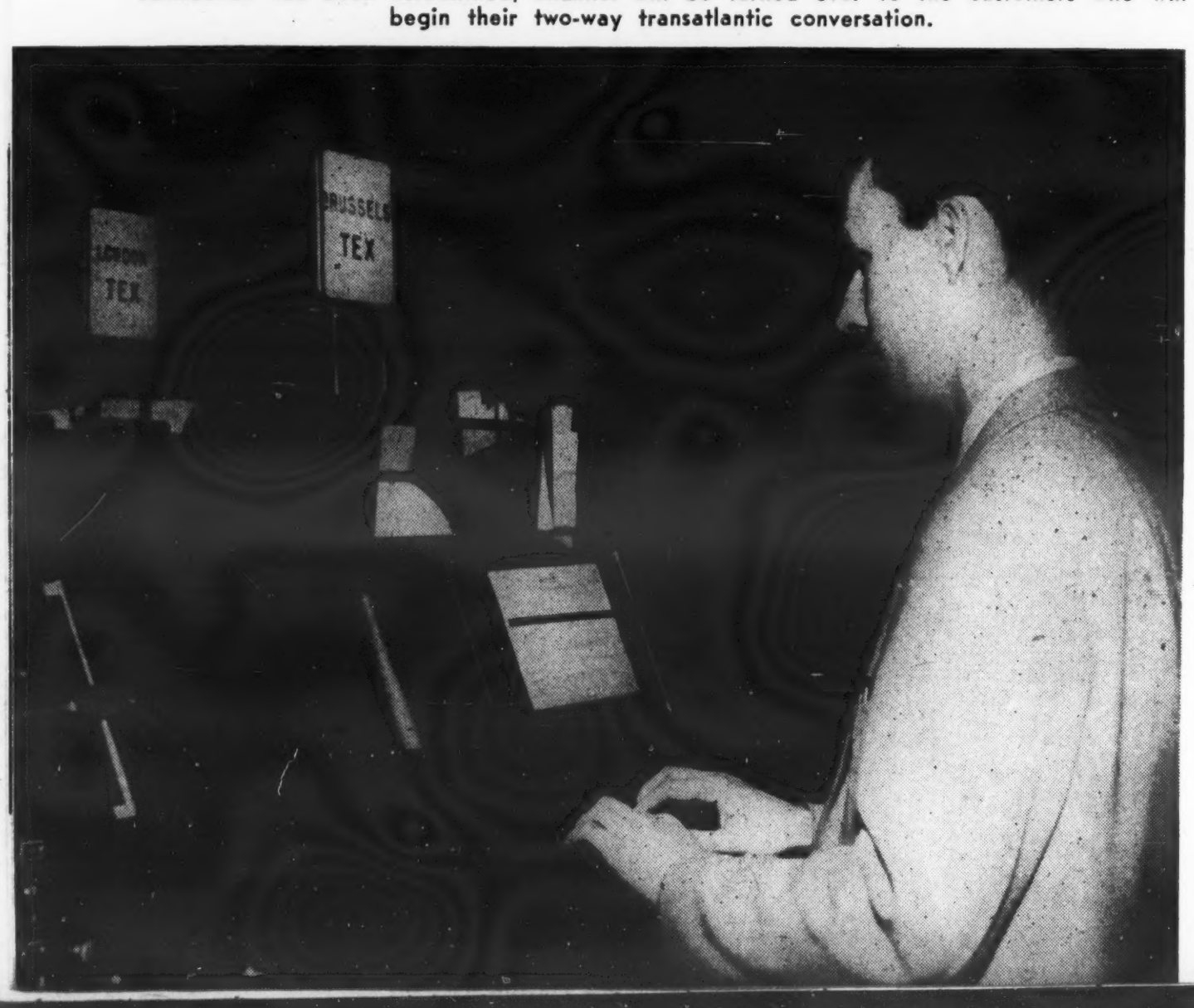
VIA RCA

35 years after transmitting its first overseas message, RCA is again making communications history with its fast-growing international teleprinter exchange service.

BOTH THE RADIO CORPORATION OF America and the concept of an independent United States system of international telecommunications were spawned in the years immediately following World War I. Their symbols were steel antenna towers of skyscraper proportion and massive Alexanderson Alternators which substituted the primitive force of long waves for today's less spectacular but more efficient high frequency techniques.

During this period, the opening of scores of direct RCA radiotelegraph circuits to countries never before reached directly from the United States was front-page news, for the public had not yet grown accustomed to being amazed daily at the results of scientific progress. These early advancements, however, were neither more progressive, nor more numerous, than those less publicized developments which have widened and improved the scope of RCA's international communications services in recent years.

An operator in RCA's New York Terminal sets up a TEX call with Brussels, Belgium. Once connection has been established, channel will be turned over to the customers who will begin their two-way transatlantic conversation.



Today, 35 years after it processed its first overseas radiomessage, RCA is again making international communications history with TEX, a two-way, customer-to-customer teleprinter exchange service which it pioneered and developed since the close of the second World War.

In concept, TEX had been considered by the industry for many years as a near ultimate in international record communications but it remained for RCA leadership to develop the equipment and methods by which the goal could be attained.

At the outset, the success of the program depended on RCA's ability to provide a sufficient number of overseas radio channels to accommodate the projected new service. This was especially difficult since RCA's regular radiotelegraph business had expanded after World War II, and additional circuit capacity was urgently needed to facilitate its growth. Still further complicating the problem were the agreements of the 1947 Atlantic City Convention which resulted in a reduction of RCA's allotted operating frequencies.

As a solution, RCA engineers turned to time-division multiplex . . . terminal operating equipment which permits the imposition of four separate traffic channels on a single radio frequency. Initially, through the installation of electro-mechanical multiplex and later by means of wholly electronic multiplex terminals, RCA was successful not only in creating the necessary additional capacity to

accommodate its increasing overseas radiotelegraph traffic but produced as well the new channels required for the projected customer-to-customer service. The scope of this expansion program is illustrated by the fact that in 1950 there were 20 active multiplex channels in RCA's New York operating terminal whereas at the end of 1954 there were 80.

Once having found a way to produce the necessary channels on which TEX service could be operated, RCA's next step was to provide automatic error detection and correction equipment which would assure, within limits, the error-free radio transmission and reception required for practical customer-to-customer communication.

Equipment of the type needed was even then being developed in the Netherlands by engineers of RCA's correspondent company who had based their designs on a number of RCA patents. Known as ARQ, this equipment automatically monitors radioteleprinter transmissions, detects distorted characters, and momentarily halts the transmission until the defective character has been retransmitted and correctly received at the overseas point. Under normal conditions, the equipment's entire cycle of operation consumes less than a second and causes no noticeable change in the sixty word per minute transmission speed which is standard in overseas teleprinter exchange service.

Since the Dutch had available both multiplex and ARQ equipment, it was only natural for RCA to inaugurate international TEX service by establishing the first circuit between New York and Amsterdam. This was done in May, 1950 when, using the new protected radio channels, RCA joined its own private customer teleprinter system in New York with the Telex network of the Netherlands.

Western European Telex is the equivalent of the TWX service operated in the United States by the American Telephone and Telegraph Company while RCA's private teleprinter system is used to link its operating terminal with hundreds of business firms throughout the New York area. These firms are all large-scale users of international communications service and the direct lines are used to expedite the flow of regular radiotelegraph traffic between their offices and the RCA terminal. TEX simply put the customer's teleprinter to another valuable use.

Following its inauguration, the growth of TEX was phenomenal, primarily because the international business community had long been hungry for a service which embodied its advantages and flexibility. Aside from the high degree of transmission accuracy assured by the ARQ equipment, TEX service was fast, low in cost, and provided a permanent written record of the entire two-way conversation.

Before the end of 1950, the service had been extended to RCA customers in Washington, D. C., and through the facilities of the Netherlands administration, the TELEX subscribers in Germany and Denmark. Subsequently, TEX channels were opened to Switzerland, France, Germany, Belgium, Norway, Sweden, Luxembourg, Finland, Spain, Portugal, England, Hungary, and the Belgian Congo. Service was also established between San Francisco and Honolulu.

During the past two years RCA has almost doubled the number of its customer teleprinter installations and today, United States business men can be connected through these facilities to any one of 20,000 TELEX subscribers throughout Western Europe.

In the few years since its inception the high level of customer acceptance accorded TEX has led RCA to develop long-range plans for the continued expansion of TEX both by making it available in the United States on a more wide-spread basis, and by extending it to additional foreign points.

ARQ equipment, shown in photo, monitors traffic on RCA overseas TEX circuits, automatically detects and corrects signal distortions caused by adverse conditions on the radio-path.

Time division multiplex, which splits a single radio frequency into four separate traffic carriers, was used by RCA to create the radio channels needed for overseas TEX service.

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Global Communications at the Business Level

by Walter E. Ditmars
President
The Gray Manufacturing Company

Mr. Ditmars

AN AMERICAN BUSINESSMAN recently back from a world air tour pointed up one facet of the many-sided problem of improving global communications in a story of a situation he encountered in India. Arriving at Bombay on a flight from Rangoon, he faced a puzzled inspector for the Indian customs service.

"What is this?" asked the official, pointing to a dictating machine in its unzipped traveling case.

"That is my dictating machine," the traveler replied.

"What is a dictating machine? What do you do with it?" asked the suspicious inspector.

"It records my voice on a plastic disc so I can send messages back to the United States or to friends and business associates in other countries. I used it for dictating letters, making a record of ideas when they come to mind, for recording conferences, and other purposes," the man answered, beginning to wonder if there were some law against such equipment in India.

"Oh" was the answer, signifying that he didn't understand, or believed the American was covering up some sinister purpose with doubletalk. "Wait here," he said, and walked away.

Fifteen minutes passed before the customs man returned with his supervisor. The latter politely asked questions as to the purpose of the machine, where it was purchased, how it would be used in India, and, with apologies for delaying him, approved his customs declaration.

This was not the first dictation machine brought into India. Electronic devices similar to the device have been in use in business offices throughout India for many years. It is obvious, however, that such equipment is unfamiliar to the vast majority of people in the less industrialized areas of the world.

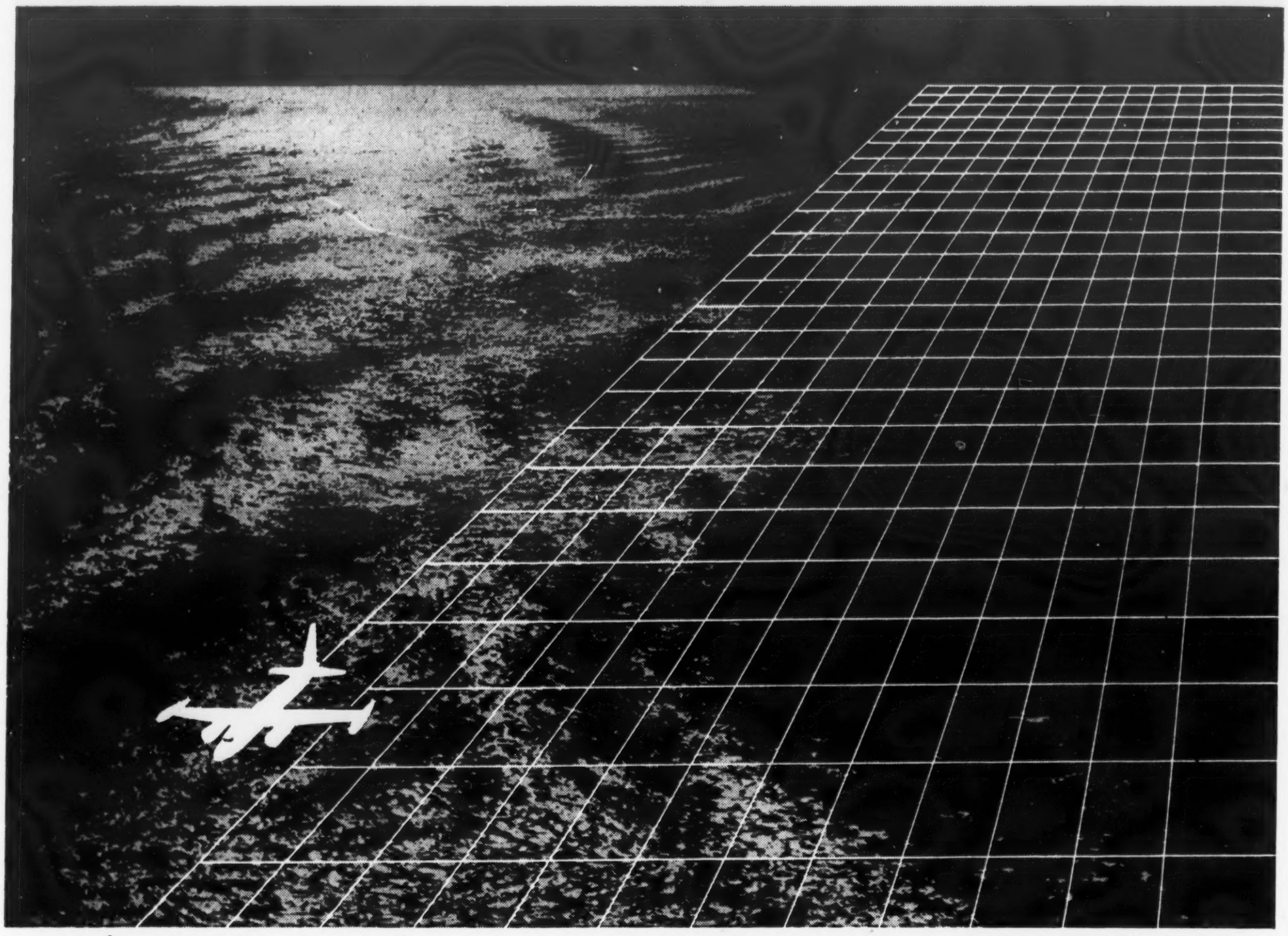
The story would indicate also that few travelers from this country carry dictation machines with them, despite widespread recognition of the value of such equipment in maintaining fast, economical communication with the home office, branch offices or customers.

In this critical period of world history, it has been repeated time and again that "we must improve our communications," to the extent that it is becoming almost trite. We recognize that we must inform the leaders, and peoples, of all countries on the fringes of the Iron and Bamboo Curtains, about our objectives, our policies and our hopes for a better future for ourselves and for them. We have spent billions for information programs of many kinds, and still we are told we must do more. that our programs are not doing the job.

As a businessman and an American, I suggest that more emphasis on communications at the *business* level, between business men in this country and their counterparts in the other free countries of the globe can supply the missing link to weld those who should be our allies and friends to our way of life. Let businessmen and ordinary citizens, using the everyday tools of communications, and in the pursuit of their practical objectives of selling American goods in two-way trade, demonstrate the overwhelming advantages of the free way of life.

I submit this can be done. To use the product of my company as an example, a dictation machine can serve a dual role: in improving global communications by facilitating exchange of information and ideas among businessmen, and more important, by serving as a symbol of how an American-made electronic machine, produced with the know-how which makes us strong in war, can be used for improving the lot of man everywhere.

Let us work to put in the hands of businessmen in other countries the same wonderful devices for improving communications that we know. Then the customs inspector at Bombay will understand the American businessman better. Then the inspector and the businessman will have more in common than they have today, tangible evidence that we are making progress in "selling" our way of life.



Manhunt

on a grid etched in the ocean!

The ocean isn't trackless any more.

Today, rescue planes anywhere on the seven seas — at any distance from a shore check point — can fly a search pattern as precise as a grid laid out on land. In fact, the grid is literally etched by electronics on the face of the globe. Search runs *by the same plane* can be flown along exactly parallel lines.

A new navigation unit with a cybernetic brain, developed by General Precision Laboratory in cooperation with the Air Force, links plane course with grid course. It is never fooled by shifting winds, nor fazed by absence of sun, stars or radio beams. Ceiling can be down on the deck, but the search goes along grid lines like flanged wheels on rails.

With inexhaustible patience, this electronic brain keeps a mile-by-mile record of plane speed in climb, cruise or descent, in turbulence or still air . . . notes every shift in course, measures and remembers each variance in wind. It gives an exact fix, at any instant of flight.

Its uses are many, in precision flight free of ground communication. Search and rescue is an obvious one. And morale is higher when airmen know that if they are downed in the far reaches of a strange ocean, rescue planes will look for them with a device that follows signposts in the sea.

This device emerged from the advanced research and development work of GPL; it is typical of the challenge it offers engineers, the facilities it adds to the nation's might.

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ITEMS OF INTEREST

From Government, Industry and the Services

AIRBORNE RADAR AND WAVE PROPAGATION LABORATORY

The Naval Research Laboratory has instrumented an R5D aircraft (Douglas DC-4) as an airborne radar and radio wave propagation laboratory.

Four radar sets, in the frequency range from 1,000 to 10,000 megacycles, are mounted in nacelles beneath the wing. A 15-foot mast, mounted approximately midway along the fuselage, may be raised and lowered in flight and houses instruments for making meteorological observations.

In addition to four radar consoles, the cabin of the plane contains the necessary control equipment, including eight two-gun cathode-ray oscilloscopes, with cameras for recording the data obtained during the experimental flights.

The installation was designed to be as versatile as possible for investigation of a wide variety of problems in two general fields of interest to the radio engineer, those of radar target properties and of radio wave propagation.

In the first field, it may be used to determine the reflecting or backscattering properties either of individual targets or of area-extensive targets such as ground, sea, or precipitation.

In the radio wave propagation field, it may be used as one terminal of a one-way transmission link, such as in investigation of radio ducts and atmospheric scattering.

The meteorological instruments will provide supplementary data, including wet and dry bulb temperatures, refractive index of the air, rain drop size and distribution, accelerations, electric fields, total water content, and total pressures of the air.

by David L. Ringwalt, NRL

Pictured on the left is the Navy's new flying radar laboratory, R5D2-2. Four radar sets are mounted in nacelles below the wing. The 15-foot mast raises and lowers in flight and houses meteorological instruments. The Naval Research Laboratory will use the new research tool in its program of radar and radio wave propagation studies.

Air Force to Test Global Navigation Aid

Far-ranging jet aircraft will receive extremely long-range navigation aid from an experimental radio station to be constructed at Camden, New York.

This station is the first experimental step in providing world-wide navigational information to military and commercial aircraft.

Using a new long-range system called Navarho, developed by Air Research and Development Command's Rome Air Development Center, Rome, New York, the station will beam information 2500 to 3000 miles in all directions.

A single Navarho station can cover an area bordered by the West Coast of the United States, the Azores on the east, the Arctic Ocean on the north and the Gulf of Mexico on the south.

By receiving continuous information on his position, the pilot can plot a direct course. In larger planes, computers will do most of this plotting automatically.

A plane 1000 miles from the station will receive information accurate to within 10 miles in any direction, and will be directed to a point 100 miles from its destination, where it can pick up short-range radio signals as a guide for landing.

If the experimental station is a success, it will become the first in a world-wide chain of installations providing navigation aid to planes anywhere on the surface of the globe.

New FCDA Leaflet Gives H-Bomb Facts

No longer can any American avoid the responsibility for learning everything possible about personal and community survival.

This is the key admonition in an illustrated leaflet just published by the Federal Civil Defense Administration, entitled "Facts About the H-Bomb."

One million of these leaflets, designed to tell Americans how they can survive a superbomb attack and the accompanying peril of radioactive fall-out, are being distributed throughout the country through regional, State and local civil defense agencies, schools, churches, industries, national organizations and other channels.

"The H-bomb," the leaflet points out, "is larger than the A-bomb—but it is still a bomb. It has its limits, as does any other weapon. It makes the civil defense problem larger, but not different."

These leaflets are available from the Superintendent of Documents, U. S. Government Printing Office, Washington 25, D. C. Price per 100 is $2.75.

Portable X-Ray Uses Atomic Power

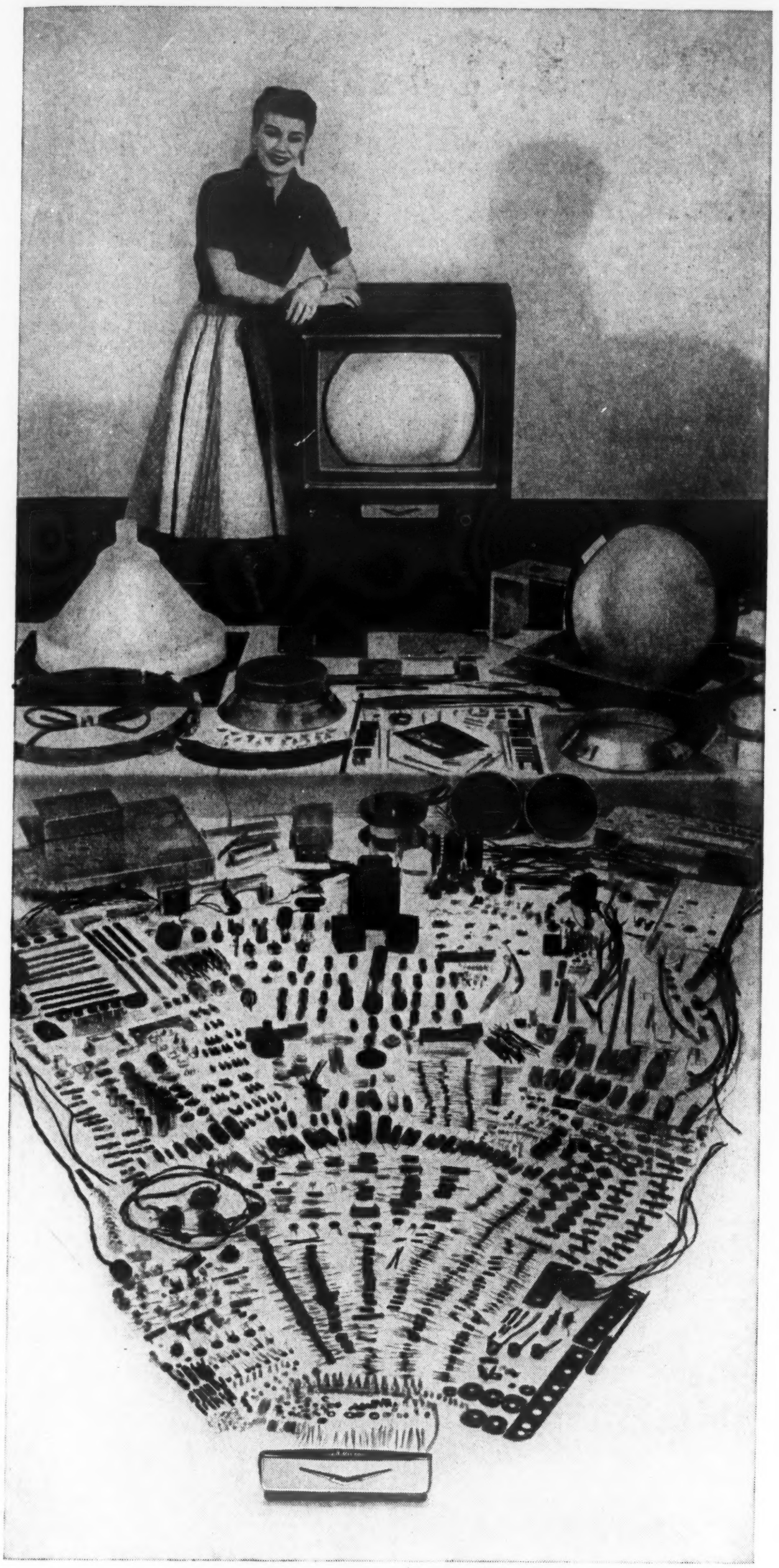
X-rays of wounded soldiers on the battlefield can be made with a newly designed portable x-ray unit now being subjected to further tests by the U. S. Army.

The new device, powered by radioactive thulium is capable of producing an x-ray picture without electricity, water, or a darkroom. The complete unit, which also includes a film holder, weighs only 48 pounds and may be carried on the back of a medical aid man.

Extensive tests at the Army Medical Research Laboratory, Fort Knox, Kentucky, have proved that the one-quarter inch lead plate which contains the radioactive thulium protects the user from accidental radiation exposure. Under normal use, the tiny piece of thulium is expected to be effective for about one year.

The developer is a self-contained cassette, or film holder, in which all pictures are made with radiosensitive

(*Continued on page* 100)



This picture shows how RCA helps small manufacturers grow

Today the inter-dependence between manufacturer and supplier is stronger than ever in the history of American business. For in the challenging new age of electronics, hundreds upon hundreds of component parts are needed in the manufacture of new products.

For example, the superb new RCA Victor 21-inch color TV set shown here contains 2,070 parts. These are made by 600 different suppliers, most of whom are small businesses.

Indeed, more than three-quarters of all RCA suppliers are small business firms that receive nearly one-half of RCA's purchasing dollars. They, in turn, have their suppliers of raw materials. Thus through a long line of cooperative effort, employment is provided for countless people in many fields—and an entire economy benefits.

RCA salutes its full roster of 7,500 suppliers, located in 43 states, for their inventiveness and resourcefulness that contribute so much to the quality and performance of its products. With these firms at our side, RCA continues to march forward, creating new and better "Electronics for Living"—electronics that make life easier, safer, happier.

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ELECTRONICS FOR LIVING

paper and pads instead of film. The paper and pad are saturated with developer and stabilizer and are separated by leak-proof dividers.

The cassette is wrapped with a light-proof and waterproof covering. As the cassette is exposed, the dividers are removed and the radiation-sensitive paper records the radiograph. Radiographs that are produced lack the fine detail of standard x-ray films, but they are suitable for field and emergency use.

NBS Develops Accurate Audio-Frequency Instruments

Accurate measurements of audio-frequency current and voltage can be made easily and rapidly with two instruments devised by the National Bureau of Standards.

The first instrument, known as a volt-ampere converter, provides 0.05 per cent accuracy for laboratory use in conjunction with d-c potentiometer. The second, called a thermocouple volt-ammeter, is a portable, direct-reading device with an accuracy of 0.5 per cent.

In the volt-ampere converter, the heater of a single thermal converter is connected in series with appropriate resistors for voltage measurements and in parallel with appropriate shunts for current measurements.

A useful feature of the volt-ampere converter is a 7.5-ma, 0.5 volt rectifier instrument, which is switched in place of the heater when the thermal converter is connected to the internal d-c source. This instrument tells at a glance what effect circuit changes have on the measured current or voltage. It also indicates within 5 per cent what voltage to set on the potentiometer.

The thermocouple volt-ammeter consists essentially of a d-c millivoltmeter connected to the output of the thermal converter.

AC-DC difference and temperature coefficient tests indicate that this volt-ammeter has an accuracy within 0.5 per cent over an extended range of temperatures.

Development of these instruments at NBS has demonstrated the high order of accuracy attainable over wide frequency ranges by application of the transfer principle to the measurement of both current and voltage.

It is hoped that a wider laboratory use of electrothermic instruments may result from the reductions in the limitations of conventional thermocouple instruments that have been accomplished by these new circuits.

Radio Specimens Photographed in 3-D

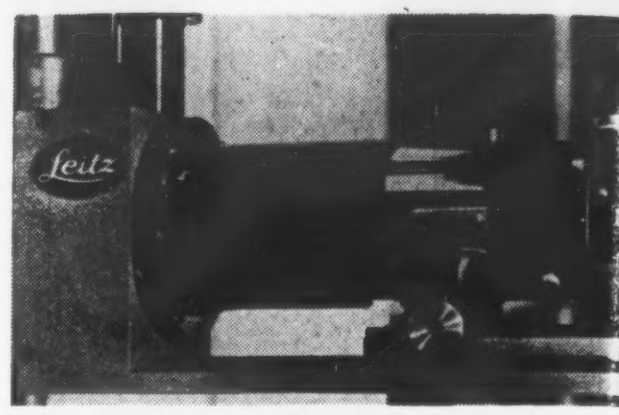
Atomic scientists can now see and photograph radioactive specimens in three dimensions. An unusual "periscopic, stereoscopic telescope" makes this possible.

One of the first of its kind, this device was designed and built by E. Leitz, Inc., for the Knolls Atomic Power Laboratory, Schenectady, New York, operated by the General Electric Company for the Atomic Energy Commission.

Pictures of radioactive specimens may be mounted as slides for projection, or for eye viewing. Single exposures may also be made through one side of the stereo system for two-dimensional prints or slides.

The total length of the device, or its optical path, is 20 feet. Its lenses magnify the image 120 times, compared with unaided viewing at this distance. The object field that is seen or photographed is approximately 45mm in diameter.

The focusing scope is ample to permit exploration of the specimen through a wide range of depths. The oculars are arranged to allow adjustment for changes in the distances between lenses, and for individual focusing adjustment to balance unmatched vision.



Shown above is a side view of the lower section of a new stereoscopic viewing system, designed by E. Leitz, Inc. for the AEC's Knolls Atomic Power Laboratory, which enables scientists to see and photograph radioactive specimens in three dimensions.

Over-the-Horizon Transmission Accomplished By Bell Labs

Bell Telephone Laboratories and the Massachusetts Institute of Technology have announced that direct television and multi-channel telephone transmission through space for as much as 200 miles—without relay stations and at ultra-high frequencies—has been accomplished.

Television pictures, as well as radio and telephone conversation can be sent over-the-horizon on ultra-high frequencies in an extension of a transmission technique applied to the continental defense system.

In order to provide reliable long distance transmission, Bell engineers erected larger antennas and used higher power than is employed in the conventional microwave system.

In this way, they put to use the weaker signals that drop off a straight radio beam beyond the horizon and are reflected or scattered to distant points by the atmosphere.

Principal virtue of over-the-horizon transmission is that longer communications bridges are possible over water and rugged terrain. In the present microwave radio relay network across the United States, relay stations are 30 miles apart.

Bell and M.I.T. scientists emphasize that this success with over-the-horizon transmission will probably result in a supplement to, rather than a replacement of, line-of-sight radio relay systems.

Drone Aircraft Control System

A new, improved system for remote control of jet fighter aircraft. on special "drone" missions, pilotless intercept or nuclear tests, has been announced by the Air Research and Development Command and the Sperry Gyroscope Company.

The system provides automatic takeoff and landings, with exact split-second control by radio and radar during climb and dives, cruise, orbiting or other aerial maneuvers.

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New UHF radio guidance and command sub-systems supply "tighter" precision signals to the drone fighter craft, from USAF jet pilots at the "beeper" ground stations or in an accompanying jet "director" plane.

If the plane is below a pre-selected altitude when carrier signals are shut off, in 5 seconds an electronic "brain" takes over the plane controls. The plane then begins a full-power climb of exactly 7 degrees, retracts dive flaps if these were extended, and at 200 mph changes to a climbing turn to the left until proper altitude is reached.

It then engages altitude control and continues a left-turn orbit at 265 mph at this constant level and position until signal is restored to guide the aircraft back for normal landing procedures.

The new system was evolved through many years of experimental flight-testing with the Sperry Company, by Wright Air Development Center of ARDC and electronic experts of USAF's operational 3205th Drone Group at Eglin AFB, Florida.

These aircraft, known as QF-80's and QB-17's, are currently employed in this year's Nevada nuclear tests.

Western Electric to Build Arctic Radar Fence

The United States Air Force announced recently that Western Electric Company, Inc., manufacturing and supply unit of the Bell Telephone System, has been selected as the prime contractor for construction of the Distant Early Warning Line radar network.

Several subcontractors, including Canadian companies, will participate in the project. The U. S. Air Force will discharge its responsibilities in connection with the project through a joint project office but may perform certain portions of the work through its own resources.

This Joint Project Office, set up in New York City, is composed of representatives from the USAF's Air Research and Development Command, Air Materiel Command, Continental Air Defense Command, Royal Canadian Air Force, the Canadian Department of Defense Production, and Western Electric Co., Inc.

The Distant Early Warning Line radar network is designed to detect enemy aircraft and to flash a warning to defense command centers in Canada and the United States seconds after the aircraft come into radar range.

Unlike World War II radar, which required the constant attention of human observers, the DEW Line equipment, developed by scientists of Lincoln and Bell Telephone Laboratories, requires a greatly reduced number of personnel than previously needed to operate radar lines.

AFCEA Committee To Study Interference In Los Angeles

A Cooperative Interference Committee, formed by Lieutenant Commander Ray Meyers of the Los Angeles Chapter of the Armed Forces Communications and Electronics Association, has launched a pilot organization to study interference in the Los Angeles area.

This group hopes to bring together the various radio services, manufacturers and the general public to study methods of reducing man-made static, cross modulation, third product harmonics and other types of interference.

The committee is composed of manufacturers, commercial and amateur radio station engineers, technicians and others interested in the problem of interference.

The progress of this group is being carefully watched with the hope that the idea will result in similar organizations throughout the nation.

Manufacturers of high and low pass filters and other devices designed to reduce man-made static or other types of RF interference should feel free to forward any data on their products to: Ray Meyers, Manager of Radio Operations; California Division of Lockheed Aircraft, Department 98-38, Burbank, California. Whenever possible, authority to reproduce such material for distribution to others interested in the project should be included.

Air Force Releases Figures On Small Business Contracts

For items that small business could conceivably produce, business concerns employing fewer than 500 persons received over three-fourths of the Air Force contracts let in the fiscal year 1954, the Air Force has announced.

A report on the Air Force's Small Business Program recently made public showed that $556 million went to these small businesses out of a potential $773 million, for a total of 76 per cent, an increase from 55 per cent two years before.

The figures include only prime contracts made directly between the Air Force and the suppliers and do not include sub-contracts which were let by other Air Force producers.

(*Continued on page* 102)

Digital Communication Engineers

with experience in the fields of

Systems Engineering
Miniaturization
Circuit Development
Electromechanical Development
Digital Techniques

Long-Range Information Transmission

New advancements in the field of long-range information transmission are being made at Hughes with digital techniques.

Areas of Work

To further expand work in this area, Hughes Research and Development Laboratories are interested in people with experience in airborne communication systems, digital storage, low frequency measurements, modulation systems, miniaturized packaging, audio, IF and RF circuitry in the HF range, analog to digital—and other data conversion methods.

Scientific and Engineering Staff

Hughes
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CULVER CITY, LOS ANGELES COUNTY, CALIFORNIA

Relocation of applicant must not cause disruption of an urgent military project.

ITEMS OF INTEREST

Analysis of each purchase request in fiscal year 1954 showed that 13 per cent of the total Air Force procurement was within the capabilities of small business.

Of the 5600 contracts amounting to over $10,000 in value, the average contract given to small businesses came to $76,000.

Signal Corps Tests High Power Transistor

The versatility of the tiny transistor was emphasized in a series of tests held at the Signal Corps Engineering Laboratories at Fort Monmouth, New Jersey.

Tests were made on transistors developed under Signal Corps sponsorship and built by Transistor Products, Inc., a Clevite Corporation plant located in Waltham, Mass.

The hum in an automobile radio, normally heard when the instrument is first turned on, was eliminated by using one of the newly developed transistors in place of a vibrator which changes the current from a 6 to 12-volt battery into the 250 volts needed by the radio tubes.

This indicates that moving parts may be replaced by transistors in the electronic systems of guided missiles and radar controlled beacons where moving parts are at present a serious problem.

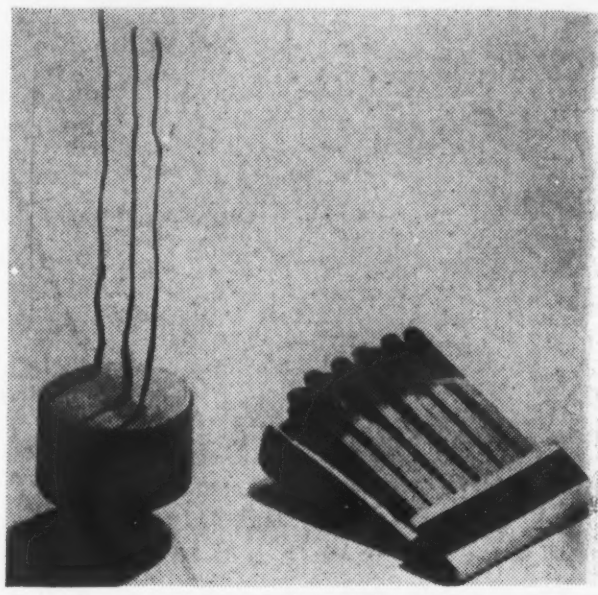
Moving parts in many electronic instruments cause difficulties which may be eliminated with the transistor. Sparks and electrical activity generate an unwanted noise in radios, and reduction of this "hash" raises costs with required extra filters and shielding.

Other applications for these transistors may be possible in jeep radios, in tanks and aircraft, fire-control mechanisms coordinating radar in guns and planes, ship and shore batteries, and a portable electric megaphone weighing less than a pound.

NEW ENGLAND HAILED AS ELECTRONICS CENTER

New England's increasingly important role as a center for the advancement of electronic sciences was hailed at the opening of a new RCA laboratory in Waltham, Mass.

Speaking at a dinner marking the opening of the new Aviation Systems Engineering Laboratory, Theodore A. Smith, vice president and general manager, RCA Engineering



A high power transistor, left, developed for the Signal Corps, shown in comparison with a book of matches, may eliminate moving parts in electronic gear. One-third the size of a vacuum tube, it is rated as twice as efficient.

Products Division, paid tribute to the Boston area's important engineering contributions.

The new laboratory will be devoted to the development of specialized electronic fire-control systems for military aircraft. Now in an initial operating stage, it is expected to employ by the year's end approximately 100 scientists, engineers and laboratory personnel.

Elaborate computing facilities will enable engineers to simulate actual performance of airborne electronic systems under flight control. Modern jet aircraft will also be at the disposal of the scientists for full scale flight tests and studies.

Manager of the new installation is Dr. Robert C. Seamans, Jr., nationally known authority on airborne electronics and for many years a member of the teaching staff at the Massachusetts Institute of Technology.

Inter-University Radio Teletype Network

The Signal Corps branch of the Army ROTC unit at Purdue University is now operating what is believed to be the first inter-university radio teletype network in any ROTC unit in the country.

The Purdue unit is using this method of communication with all other Signal Corps ROTC units in the Fifth Army area. Other units in the network are at the University of Wisconsin, University of Illinois and Iowa State College.

Major Pershing Tousley, senior instructor in the Signal Corps branch of the Purdue ROTC, proposed this idea of the teletype network as a means of providing valuable operating experience for the students. The plan was approved by Colonel Marlin S. Moody, Signal Officer of the Fifth Army, and frequency alloca-

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Electronic Mechanical

What's NEW at Melpar

NEW laboratories

Melpar has just opened its new plant at Falls Church, Virginia, in a beautiful suburban location. We have also moved to larger quarters at Watertown, Mass., and opened a new research department at Cambridge, Mass.

NEW opportunities

Melpar's continued expansion offers new career opportunities for individual growth and recognition. Men of vision and imagination who plan for the future are quick to sense the potential with this growing, dynamic organization.

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- Subminiaturization
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tions were made by the Commanding General of the Fifth Army.

Under the current program, communication is established each Tuesday at 3 p.m. (CST).

Operating on a high frequency band, the AN/GRC radio set is used. This mobile radio teletype station is the type of equipment which is widely used over the world by Army Signal Corps units for long distance communication purposes.

Radio Condenser Announces Automation Division

A new Automation Division for design and engineering connected with the manufacture of electro-mechanical assemblies has been announced recently by the Radio Condenser Company of Camden, N. J.

Consisting of design and production specialists representing the various fields of engineering, the new group will design its own electro-mechanical assemblies to fit into customers' automation programs. These will include units for radio, television, radar, guided missiles, electronic equipment, etc. On the basis of these designs, the new division will determine how best to make the company's own production automatic.

The Automation Division will be headed by Joseph S. Robb, director of Engineering, and Edward J. Penberthy, sales manager.

Society of Photographic Engineers to Hold Conference

The fifth annual conference of the Society of Photographic Engineers will be held at the Hotel Thayer, West Point, New York, May 17-20.

Sponsored this year by the Army Signal Corps, it will include papers on the latest photographic advances plus exhibits by equipment manufacturers.

Dr. Edwin H. Land, President of the Polaroid Corporation, will be guest of honor and receive the Society's second annual award for outstanding contributions to the science of photographic engineering. He has pioneered the "picture-in-a-minute" technique.

Technical papers will include phases of photographic instrumentation techniques, apparatus, optics, black and white color processes, and evaluation of photographic performance of materials and equipment.

Further information may be obtained from Steven Levinos, Conference Chairman, and Chief of the Photographic Branch, SCEL, Fort Monmouth, N. J.

(*Continued on page* 104)

INDUSTRIAL POCKETSCOPE

by Waterman

ANOTHER EXAMPLE OF Waterman PIONEERING...

The INDUSTRIAL POCKETSCOPE, model S-11-A, has become America's most popular DC coupled oscilloscope because of its small size, light weight, and unique flexibility. This compact instrument has identical vertical and horizontal amplifiers which permit the observation of low frequency repetitive phenomena, while simultaneously eliminating undesirable trace bounce. Each amplifier sensitivity is 0.1 Volt rms/inch. The frequency responses are likewise identical, within —2 db from DC to 200 KC. Their total undistorted outputs permit effective trace expansion of twice the screen diameter. The internal sweep generator is continuously variable from 3 cycles to 50 KC and can be synchronized from positive going signals. Return trace blanking is optional. Intensity modulation is accomplished by connecting either directly to the grid of the three-inch cathode ray tube or thru an amplifier having a gain of approximately 10 and a flat response to 500 KC. Direct intensity modulation threshold voltage is approximately 1 volt rms. Additional provisions for direct access to all the deflection plates, the second anode, and the amplifier output terminals extend the usefulness of the S-11-A many fold.

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S-15-A TWIN TUBE POCKETSCOPE
RAYONIC® Cathode Ray Tubes and Other Associated Equipment

ITEMS OF INTEREST

Human Engineering Institute To Hold Third Meeting

The third Human Engineering Institute will be held June 6-10 in Stamford, Connecticut.

This organization is primarily concerned with increasing management awareness of human engineering and the benefits it offers in product improvement, production economies and sales advantages.

Various topics slated for discussion include human capabilities and limitations as factors in equipment design; the value of quick, inexpensive experiments to obtain data; and techniques for evaluating a design in the blueprint, prototype, and operational phases.

Filmed TV Programs Aid Instruction at Fort Monmouth

The addition of a motion picture film chain to the closed circuit television system in operation at The Signal School at Fort Monmouth was recently announced by William R. Brooks, chief of the Educational Television Branch.

WFM-TV transmits over cable to more than 65 classroom buildings and five theaters. The newly installed system takes the picture and sound from a movie film and projects it into a small specially built television camera which sends the signal to television sets.

A classroom instructor now has two channels to pick up television information. Previously, both live and filmed presentations originated in the WFM studio, making only a single program available to the classroom at one time.

Installed by General Precision Laboratories, it is a standard piece of equipment used by many commercial television studios. At the Signal School, however, it will serve the specific job of bringing training films and kinescope recordings into classrooms.

PFC Ernest E. Courcheno of the Signal School operates the newly installed Vidicon Film Chain in WFM-TV, Fort Monmouth's closed circuit television system, whose Educational Television Branch telecasts daily school training programs to 4200 students in wire communications, radio, radar and photography.

The timing of classroom instruction with television showings is coordinated by a special television committee which meets every two weeks.

The group comprises instructional representatives in the School and the Educational Television Branch. Their decisions include film scheduling and planning of studio presentations.

Faced with the task of instructing great numbers of soldiers in the highly technical fields of wire communications, radio, radar and photography, The Signal School looks to its closed circuit television system as one of the most important methods of cutting the vital time needed for training.

Proof of the success of this training system is the fact that an additional film chain is soon to be installed, adding a third channel for instruction purposes.

Amateur Radio

Amateur Radio Club at Electronic Supply Office

The Amateur Radio Club and Station W9JAM, organized by military and civilian personnel of the Navy's Electronic Supply Office at Great Lakes, Illinois, is ready for station operation.

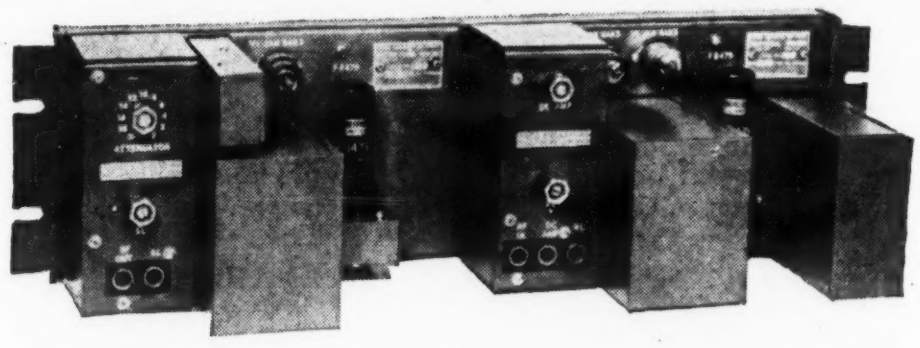
Station equipment includes two 400 watt transmitters,—one 25 watt transmitter—and three receivers. A twenty meter rotary beam antenna, and 40 and 80 meter long wire antennas have been installed. Additional equipment is being added to insure operation on all amateur bands.

The Amateur Radio Club was organized by the licensed radio amateurs employed at the Electronic

(*Continued on page* 106)

FREQUENCY-SHIFT V-F CARRIER-TELEGRAPH SYSTEM

Provides one, two, or three frequency-shift teletype channels above the voice on a 3400-cycle telephone circuit



A send and a receive panel require 5¼" of mounting space on a standard 19" rack

This system provides an economical trouble-free method of obtaining up to three full-duplex 100 wpm telegraph channels at the upper end of a broad-band telephone channel, and still retain a 2950-cycle voice circuit. Mid-channel carrier frequencies of 3120, 3240 and 3360 cycles are employed. The mark frequencies are 30 cycles below and the space frequencies are 30 cycles above the mid-band frequencies. The three telegraph channels are transmitted in the band 3080 to 3400 cycles, leaving the band below 2950 cycles for the voice channel.

Fault-free teletype circuits are obtained, even where the telephone circuit on which they are superimposed suffers from noise or abrupt level variations which may be so great as to render on-off keyed signals unintelligible. Frequency-shift signals do not suffer deterioration from non-linear transmission, such as is caused by overloading in voice-frequency, carrier or radio equipment. Under most circumstances a signal-to-noise ratio per channel as low as 20 db is satisfactory, and under some conditions even lower ratios result in fault-free operation. This equipment meets the requirements of current MIL specifications wherever applicable.

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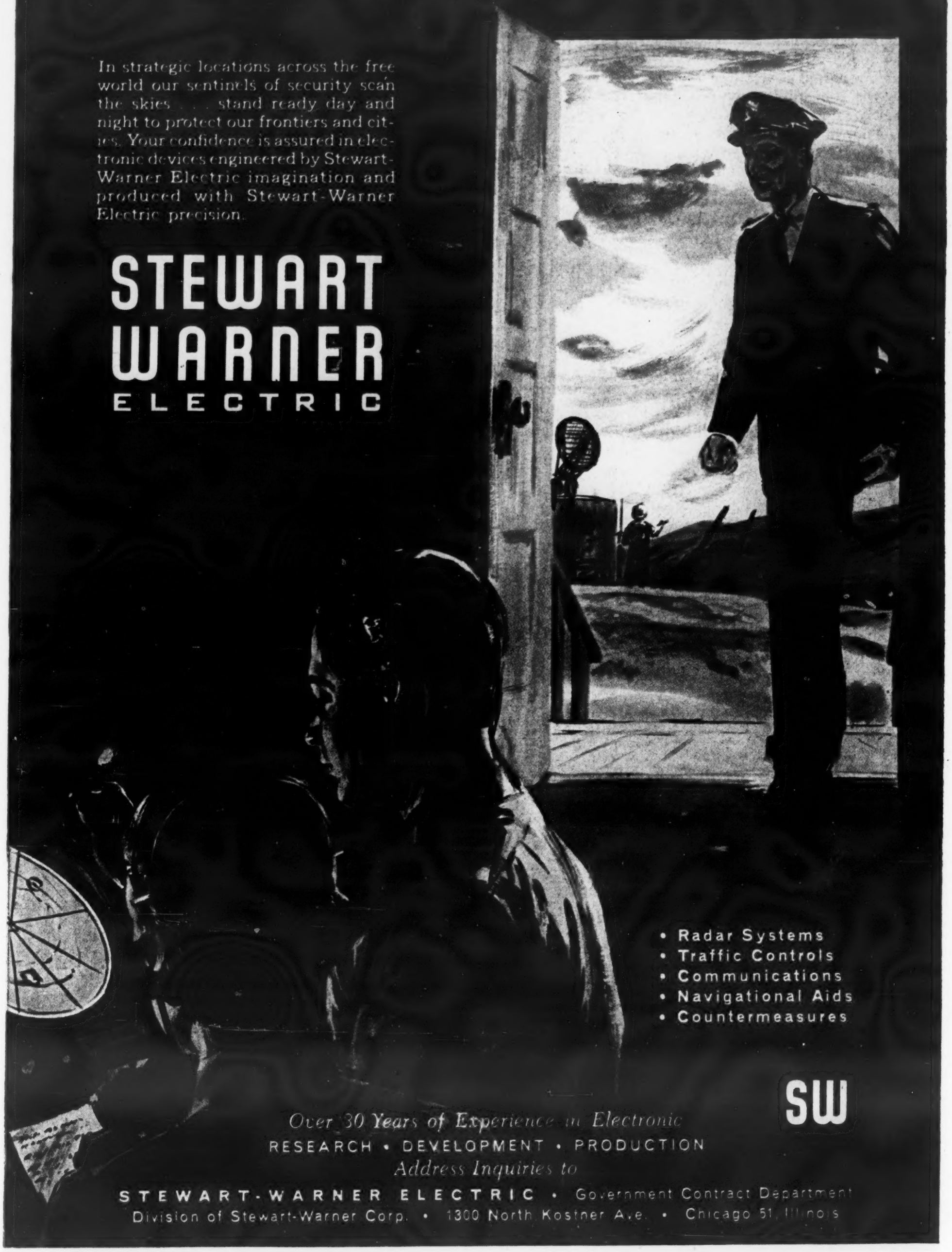

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ITEMS OF INTEREST

Supply Office to provide training in radio, for all personnel who desire it, with the aims of encouraging amateur radio as a hobby, and giving those not interested in obtaining licenses a more thorough knowledge of basic radio and electronics.

How well the club has succeeded in its aims is evidenced by the fact that 16 students of the theory and code classes have recently earned Novice licenses, and are continuing their studies in after-duty hours.

These classes help to give Electronic Supply Office personnel a better understanding of their jobs, since the over-all mission of the Electronic Supply Office is to supply all the electronic repair parts required afloat and ashore to keep our Navy equipments operating.

Captain E. F. Metzger, SC, USN, Commanding Officer of the Electronic Supply Office, has stated that he considers the experience of the members of the Amateur Radio Club invaluable in training other employees in the operation of radio equipment. This training will create a reserve supply of radio operators and electronics technicians who can aid military and civil authorities in time of local or national emergency.

RETMA Amateur Radio Course Available

According to the *Industry Report* of the Radio-Electronics-Television Manufacturers Association, the RETMA Amateur Radio Course is now ready for distribution.

This course, developed by the Amateur Radio Activities Section, Parts Division of RETMA, consists of a text outlining the basic theory of radio reception and transmission, the "License Manual" of the American Radio Relay League and five code practice records.

Available through RETMA headquarters for $10, the course is designed to interest technically-minded young people in amateur radio and help them obtain an FCC amateur license.

A brochure describing the course is available on request from RETMA headquarters: 777 14th Street, N.W., Washington 5, D. C.

General Electric Announces "Operation Crystal"

G-E Ham News, a bi-monthly publication of the Tube Department of the General Electric Company, has recently announced "Operation Crystal," a contest for amateur radio operators.

All radio amateurs are invited to submit designs for emergency crystal diode detectors for use during times of disaster when normal communications have been cut off.

Awards of $10 tube certificates for the three most outstanding emergency crystal diode designs submitted for publication for each issue during 1955 will be given by *G-E Ham News.*

Interested amateurs should send their designs, but not their models, to: *G-E Ham News,* Tube Department, General Electric Company, Schenectady 5, New York. Notes on local receiving conditions should also be included in all contributions.

Personnel

Gilbarte Named to Newly Created Post at Admiral

John F. Gilbarte, manager of Admiral Corporation's Government Sales Division, has been elected to the newly created position of vice president, Government Laboratories Division of Admiral Corporation.

John F. Gilbarte

Mr. Gilbarte joined Admiral in 1943 as assistant to the executive vice president and manager of the Government Sales Division after serving as chief of the Production Control Division of the U.S. Signal Corps Engineering Laboratories.

He is vice president of the Washington Chapter of the Armed Forces Communications and Electronics Association and a member of the American Ordnance Association and the National Security Industrial Association.

His headquarters will continue to be in Washington, D. C.

Captain Tucker Named New Director at NRL

Captain Samuel M. Tucker, USN, has been named director of the Naval Research Laboratory, succeeding Captain Willis H. Beltz, who is retiring from Naval service.

Among his many posts, he has served as officer in charge of Air Defense and Electronic Aids to Navigation Section in the Office of the Chief of Naval Operations, and as Assistant Chief of Research in the Office of Naval Research.

Captain Tucker is a radar expert, having served as the first Officer in Charge of the Radar Section of the Bureau of Ships. In connection with his work on radar, he received a letter of commendation from the Secretary of the Navy "for outstanding achievement in the development of radar."

Deaver Elected Vice President Of Automatic Electric

At a recent directors meeting, Darwin H. Deaver was elected vice president and general manager of Automatic Electric Sales Corporation.

In this new position, he will direct all operational activities of the sales organization.

Mr. Deaver, an AFCEA member, came to Automatic Electric in 1945. Since joining the company, he has held a succession of responsible administrative posts, including manager of supply sales, and assistant to the president, the position he held prior to his new assignment.

During World War II he served as a procurement specialist with the Navy Bureau of Aeronautics..

Dr. Kelly Becomes Chairman of USAF Scientific Advisory Board

Dr. Mervin J. Kelly, president of Bell Telephone Laboratories, Inc., has recently been named to succeed Dr. Theodore Von Karman as chairman of the USAF Scientific Advisory Board.

In submitting his resignation, Dr. Von Karman explained that he is also chairman of NATO's Advisory Group on Aeronautical Research and Development and felt that he should resign one of these chairmanships to devote full time to the other.

Dr. Kelly began his Bell System career as a research physicist with the Western Electric Company in 1918. In 1925 he became associated with the Bell Laboratories and in 1936 was appointed director of research. He was named president of the Laboratories in 1951.

Felix Elected Vice President of Avco

Clarence Felix, vice president and general manager of Crosley Government Products Division, has been elected a vice president of the parent company, Avco Manufacturing Corporation.

Mr. Felix will continue to act as general manager of Government Products, a division producing electronic systems, airframe components, and many other articles of defense material.

(*Continued on page* 113)

AFCEA Members Available to Industry

The pages of SIGNAL are open to active AFCEA members who are seeking positions in the communications, electronics and photographic industries. Any member is entitled to space free of charge in this column for three issues of the magazine. Please limit your notice to five lines. In replying, employers are asked to address: Box ....., SIGNAL, 1624 Eye Street, N. W., Washington 6, D. C. Letters will be forwarded to the AFCEA member.

RETIRING USCG LCDR, 30 years communications-electronics experience, operational and supervisory. Six years as instructor and CO of radio op school; 1st class FCC commercial license. Available 1 Feb. 1955; New England area preferred. Box 108.

RADIO-TV TECHNICAL DIRECTOR. Six years' experience in drama and music program direction. BA in programming and production; technical background includes control room operations, equipment design, construction, maintenance. Age 26, married. Will complete tour as Microwave Instructor, The Signal School, June 1955. Prefer Chicago location. Box 109.

FORMER SIGNAL CORPS & CIC OFFICER. Age 35. Army, Air Force and civilian training and experience in personnel, labor relations, training, safety and security. College degrees supplemented by advanced training in foreign languages. Desires opportunity in export department, safety-security or personnel-industrial relations. Box 110.

SIGNAL CORPS PHOTOGRAPHIC OFFICER. Two years' experience as chief of Army type "A" lab in support of research and development. Former newspaper photographer. Technical knowledge plus strong journalistic background. Still specialist, some motion picture, aduio-visuals. BS degree. Seeks technical, publications, or sales position. Box 111.

COMMUNICATIONS EXECUTIVE (Engineering). 30 years' experience in commercial and military fixed plant systems both American and European. Senior Signal Corps officer. Widely varied background. Available in May, 1955. Box 112.

EIGHT YEARS' EXPERIENCE in transportation and communications. Background in public utilities financing, taxation, and personnel management. Education includes law degree. Box 113.

Government and Military Positions Available

Government and military agencies are invited to use this column to announce available positions which may be of interest to the readers of SIGNAL. Notices will be published three times if not cancelled before. Applicants apply as indicated in individual notices.

APPLICATIONS ARE REQUESTED for electronic, aeronautical, mechanical, industrial engineering, editorial and photography positions located in the U. S. Naval Air Missile Test Center, Point Mugu, Port Hueneme, California. Applications, and requests for the complete Vacancy List of 39 available positions with salaries ranging from GS-5 to GS-13, should be addressed to: Mr. R. A. Riebow, Employment Superintendent, U. S. Naval Air Missile Test Center, Point Mugu, Port Hueneme, California.

THE SPECIAL DEVICES CENTER, Office of Naval Research, located 25 miles from New York City at Port Washington, Long Island, needs electronic and aeronautical engineers. Applicants must possess degrees in engineering, and pertinent electronic or aeronautical engineering experience. Apply to Mr. David A. Lana, Industrial Relations Dept., Special Devices Center, Office of Naval Research, Port Washington, N. Y.

A CONSIDERABLE NUMBER OF CIVILIAN positions are now being created at the Presidio of San Francisco to replace certain military now occupying administrative positions. These openings include Civil Service Commission rated electrical engineer, civil engineer, mechanical engineer, and architectural engineer. Applicants should apply directly to the Civilian Personnel Division, Building 36, Presidio of San Francisco, California.

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WALKIE-TALKIES

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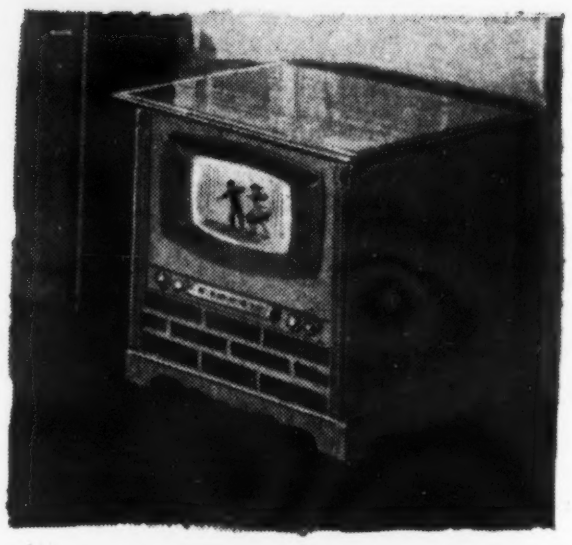

More than 150 different types of government equipment carry electro-mechanical devices designed and/or produced by Radio Condenser Company. And the country's largest electronic manufacturers have often availed themselves of this company's unique services. Reason? Because Radio Condenser takes upon its own shoulders the burden of designing, engineering, and producing the complete electro-mechanical system.

Radio Condenser Company's four large plants, four thousand skilled personnel, and thirty-four years of experience stand ready to assist *you*. Get the complete story in the booklet "Qualifications Of The Radio Condenser Company", available on letterhead request to Mr. Russell E. Cramer, President.

RADIO CONDENSER CO.
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NEW PRODUCTS from Industry

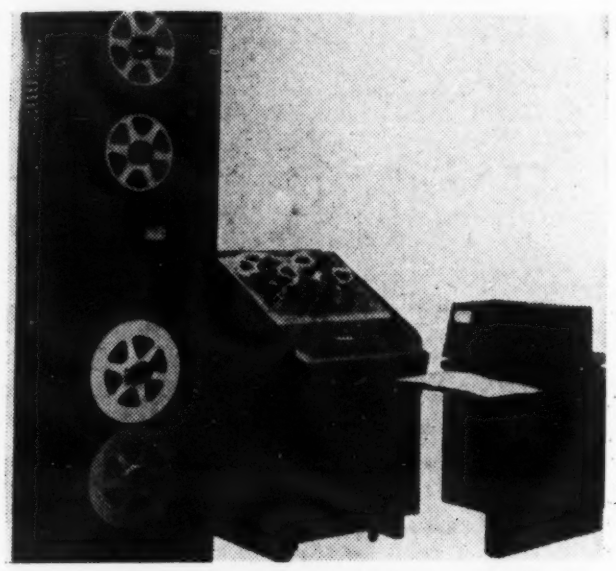
Ampex Automatic Broadcast System Announced

Automation in the broadcast industry became a reality recently when Ampex Corporation of Redwood City, California, announced the successful completion of a six-weeks' field test of its automatic programming equipment.

The system can broadcast a more than ten-hour schedule without the need for human assistance.

Basically it consists of two electronically interlocked tape play-back units, one capable of playing eight hours of recorded material from a single tape, and the other, up to four hours.

Program material is placed on the first unit and spot announcements and station breaks are recorded in the station's own studio and placed on the second machine.



Shown above are Ampex electronically interlocked tape playback units, capable of playing over ten hours of program material.

After each segment of program material and after each local announcement, a sub-audible tone is recorded. At the end of a program segment, the electronic brain "hears" this tone and starts the announcement machine. After the announcement, another sub-audible tone starts the program.

This see-saw action continues until, at each half-hour, a timing device corrects for any slight time deviation in the system and inserts a station break.

Program quality can be greatly increased by the use of the system, according to Ampex engineers. Since the equipment can be located right at the transmitter, limitations on fidelity imposed by telephone line connections between studio and transmitter are removed.

New Link Radio Mobile Unit

Link Radio Corporation of New York, N. Y., has announced the addition of the new Model 2365-M-Ed.8 mobile combination transmitter-receiver to its line of two-way radio communication equipment.

This unit, which operates in the 25-50 megacycle band (25-30 watts output), is designed to work from either a 6- or 12-volt battery without wiring, component or cable changes. The changeover is accomplished by merely shifting a plug located on the top of the chassis.

It combines a frequency-modulated transmitter-receiver with a universal vibrator power supply mounted in a single compact metal case 17" long x 8" wide x 6" high. The receiver is designed for operation in the split-channel service as well as the standard 40 kc channels.

This new equipment is expected to be most useful for police, fire departments, commercial fleets, industrial concerns and power utilities.

Broadcast Vidicon Camera Chain from Kay Lab

Kay Lab of San Diego, California. has recently developed a broadcast camera chain consisting of a small vidicon camera, camera control and remote control panel.

The equipment is ideally suited for either live or film pickup, and because of its flexible design it can be readily integrated with existing broadcasting facilities.

The camera features a double cascode video preamplifier with a bandwidth in excess of 8 megacycles. It is equipped with a protective circuit that eliminates the possibility of permanent damage to the vidicon tube due to electrical failure.

A scene permanently focused on the tube surface will not cause "burns." Consequently, the camera is especially suited for permanent installations and for pickup of advertising and identification slides.

The camera control unit consists of a video line amplifier, deflection circuits, a blanking amplifier and electronically regulated power supply. Full aperture correction and keyed clamps are included in the video circuitry. Dynamic focusing assures sharp edge focus.

Because of the extreme video amplifier sensitivity and the low signa to noise ratio of the vidicon tube high quality broadcast pictures ca be obtained with 50 to 75 footcandle of lighting.

Lewyt "Telescopic Eye" Aid to Safety

An instrument that enables the human eye to see objects hidden by darkness and dense fog at great distances may become standard safety equipment in all types of transportation.

The "Telescopic Eye," planned at the Engineers Research and Development Laboratory, Fort Belvoir, Virginia, and the Infra-Red Section of the Bureau of Ships, Washington, D. C., is now being manufactured by the Lewyt Manufacturing Corporation in Brooklyn, New York.

This new device operates with a highly sensitive infra-red receiving tube and a powerful, built-in coated lens that increases the user's range of vision. The tube "sees" all objects that are illuminated by a black, invisible-to-the-naked-eye infra-red light.

It is 14 inches long, 3 inches in diameter and weighs 5 pounds. Its infra-red tube is said to have greater sensitivity than any similar tube. It operates on either 110 volts or 6 volts direct current.

New Radiotelephone From Mackay

A new frequency-modulated radiotelephone, designed especially for VHF radio communication in shipboard service, has been announced by the Marine Division of Mackay Radio and Telegraph Company, Inc., a subsidiary of American Cable & Radio Corporation.

Known as Type 215-A, this radiotelephone is adaptable for use on all types of small craft as well as ocean-going vessels. It provides five two-way crystal-controlled channels that may be pre-set within any 1.1 megacycle band between 152 and 165 megacycles.

The unit incorporates a double-conversion super-heterodyne receiver, which assures high sensitivity and selectivity. Cascade M-derived filters are employed in the receiver's 2nd IF amplifier to provide a high degree of adjacent band rejection.

Bendix Transistorized Audio Control Panel

A new transistorized audio control panel will soon be marketed by Bendix Radio, Communications Division of the Bendix Aviation Corporation.

Bendix announces that it has received orders for the new panels from KLM Royal Dutch Airlines, via the Bendix International Division.

Initially available in two models, CNA-2A and CNA-2C, the equipment represents the first use of transistors in communications gear for airline and executive aircraft use.

These models differ only in configuration, the CNA-2A being designed for DC-6, DC-7 and Convair 340 pedestal mounting (4½" x 6½"), and the CNA-2C, ordered by KLM, conforming to the new RTCA 5.75-inch-wide standard.

The CNA-2 series emphasizes functional design. Three different types of switches are used: illuminated push-buttons for transmitting, a rotary switch for filter selection, and toggle switches for receiving.

Ansco High Speed Color Film

Ansco of Binghamton, New York, have announced their new 35mm high speed reversible color film called Anscochrome.

This new film will replace Ansco color film which has been on the market since 1942. Anscochrome is three times faster than Ansco color film, and has a daylight exposure index of 32.

It will be available in 35mm magazines and bulk loads, and also in 120, 620 and 828 size rolls, daylight type only.

The new film is claimed to have great exposure latitude and high color fidelity. Color balance is maintained throughout the color scale of a picture even with accidental over or under exposure.

Anscochrome also has higher resolving power and will enlarge, project and print with excellent results.

RCA Water-Cooled Lens System for Industrial Television

A new water-cooled lens system has been designed by the Radio Corporation of America for use with its industrial television camera in viewing high temperature operations.

Using a high-efficiency, closed-circuit water circulating system, the lens reduces infra-red radiation and lens temperatures at the camera below 120°F., giving dependable camera operation.

Water is circulated by a motor-driven pump in a closed system which includes the lens, a reservoir, and a heat exchanger.

Low-pressure air, supplied by a motor-driven centrifugal blower, is directed against the furnace side of the lens in high volume for additional cooling and for preventing accumulation of combustion materials on the face of the glass.

Switches are provided to set off an alarm in case of failure of either the air or water supply.

New Signal Generators From Hewlett-Packard

Hewlett-Packard Company of Palo Alto, California, has announced its new signal generator, model -hp-628A.

This is the first commercial signal generator to bring to this microwave range the wide range, high power, direct-reading convenience and accuracy previously available only at lower frequencies.

Frequencies are directly set and read on a single tuning dial. No calibration charts are required and output voltage is directly set and read.

The wide range, high stability and accuracy of -hp- 628A make it ideal for all types of microwave measurements requiring precisely known and controlled super-high frequency signals.

It is particularly designed for speed and convenience in microwave receiver sensitivity measurements, in determining selectivity or rejection, signal-to-noise ratio, SWR and antenna gain.

Atomic Battery Produces Electrical Energy

Scientists at the Mound Laboratory, Miamisburg, Ohio, operated by Monsanto Chemical Company for the Atomic Energy Commission, have developed an atomic battery which uses heat from radioactivity to produce electrical energy.

This new battery makes use of a thermopile (a series of thermocouples) which converts the heat from radioactive decay into electricity.

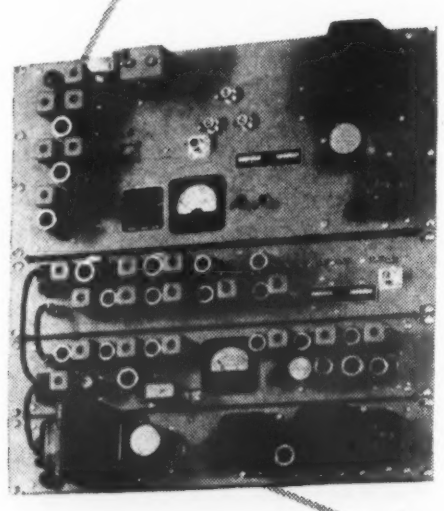
150 curies of the element polonium is sealed in a small capsule, the surface of which is in contact with the hot junctions of 40 thermocouples. The capsule is thermally insulated with a silica aerogel, and is positioned within a surrounding container on the surface of which are located the cold thermocouple junctions.

A temperature difference of about 450°F. is thus maintained between

(*Continued on page* 110)

point-to-point COMMUNICATIONS

A COMPLETE LINE



From telephone carrier to microwave, Budelman manufactures a complete line of equipment, outstanding in performance, efficiency, and low cost. Typical is the 14BW FM transmitter-receiver for multi-channel use in the 890 to 960 mc band. Compact design and low operating costs make these the ideal units for public safety, common carrier, and similar services, where reliable, trouble-free operation is so important. The 14BW, as well as other Budelman equipment, meets all applicable FCC requirements. It will meet your requirements, too, in design, quality, and performance at an economical price.

Write to Budelman today for full information on your best buy in point-to-point communication equipment.

BUDELMAN RADIO CORPORATION

381 FAIRFIELD AVENUE, STAMFORD, CONNECTICUT

the capsule and the actual container, between hot and cold junctions.

Such a battery would be desirable for applications where weight must be limited, and where apparatus is subjected to wide variations in temperature.

Krohn-Hite Regulated Power Supply

The new Krohn-Hite model UHR-240 Regulated Power Supply provides up to ½ ampere of direct current at 0-500 volts with 0.001% regulation and less than 100 microvolts of ripple.

This device, developed by Krohn-Hite Instrument Co., of Cambridge, Mass., has a dc and low frequency impedance of less than 0.005 ohms. The ac impedance is less than 0.05 ohms in series with 0.1 microhenry (4 inches of wire).

Ultra-high regulation applies over the entire operating range. For line voltages between 105 and 125 volts, the full maximum current can be drawn continuously at any output voltage.

Two 3½" front panel meters are ruggedized and hermetically sealed. Dimensions are 17½" wide, 9" high and 15½" deep.

Miniature Variable Capacitor For Pocket Radio

A new miniature two-gang variable capacitor, smaller and lighter than any previous commercial model has been developed by General Instrument Corporation of Elizabeth, New Jersey.

This new capacitor has been designed specially for miniaturized portable and pocket radios using transistors and printed circuits.

Only 15/16" high, the new component weighs barely an ounce, due to the use of an aluminum "cradle" instead of steel as in other models. It is so designed as to fit into printed circuit panels, if desired.

Core Box for Tape Wound Cores from Magnetics, Inc.

A new spun aluminum core box for tape wound cores, outmoding all previous core constructions, has been announced by Magnetics, Inc., of Butler, Pennsylvania.

Because of the strength imparted by the spun aluminum wall structure, the cores are free from distortion and deflection after winding.

The new core box together with its silicone glass insert results in a core suitable for vacuum impregnating. No varnish can get into the core box to adversely affect the magnetic properties of the tape windings.

The spun aluminum core construction together with an inert cushioning material makes these cores unusually shock proof. They are unaffected by temperatures as high as 450°F.

These tape wound cores are immediately available in 108 standard sizes, and other sizes can be made to the customer's specifications.

Shasta WWV Receiver

The Shasta Division of Beckman Instruments, Inc., Richmond, California, has announced a newly designed receiver constructed expressly to receive radio stations WWV and WWVH, the time and frequency stations of the National Bureau of Standards.

The receiver is crystal controlled, having six bands at 2.5, 5, 10, 15, 20 and 25 mc, selectable by panel switch.

The circuit features dual conversion and narrow band IF stages for maximum selectivity and image rejection. Four IF stages insure adequate sensitivity for good reception under the most difficult conditions.

This instrument is expected to find wide application in laboratories engaged in work requiring precise measurements of RF or audio frequencies, or time signals provided by station WWV.

I-T-E Potted Resistor Networks

The I-T-E Potted Resistor Network is the latest electronic component development to be announced by the Resistor Division of I-T-E Circuit Breaker Company of Philadelphia, Pa.

Potted Resistor Networks are the encapsulation of any given number of precision wire-wound resistors of specific values into one minute and compact unit of any given shape or size by the user.

They are primarily developed for resistance circuitry applications requiring miniaturization, rapid assembly, ease of replacement, maximum efficiency and design flexiblity.

Network resistance tolerances to .01% are possible. Networks have an ambient operating temperature up to 150°C.

Available mounting methods are wire lead, plug-in, screw type or any other style specified by the user. Chassis mounting of network provides for high wattage ratings. Also of importance to design engineers is that any quantity of resistors of any given value or wattage may be grouped with other components.

The RCA International Division's rapidly expanding engineering activities are providing immediate openings for

RADIO SYSTEMS ENGINEERS

DUTIES ■ Systems analysis, design and installation supervision of Radio Communication Systems in foreign countries.

REQUIREMENTS ■ Engineering degree and two or more years' experience in any of the following fields:
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Propagation Analysis—HF-VHF—Microwave Bands

BASE LOCATION ■ New York Metropolitan area with periodic overseas assignments.

REMUNERATION ■ Base pay, travel expenses and overseas bonus.

Please submit resume of experience, education and salary to:

Mr. John R. Weld,
Employment Manager, Dept. M. A-9E
Radio Corporation of America
30 Rockefeller Plaza
New York 20, New York

RCA **RADIO CORPORATION of AMERICA**

Portable Atomic X-Ray

Iso-X, a completely portable radioactive isotope X-ray machine, has recently been developed by the Nuclear Electronics Division of Litton Industries of Beverly Hills, California.

The device is adaptable for many industrial applications such as inspection and quality control functions.

The X-ray head can be inserted into assembled aircraft wings and other areas of difficult access while on the assembly line. The same thing can be done at air bases for the examination of aircraft which have suffered buffeting from storms or gun fire.

The X-ray source is thulium 170, the radioactive isotope of a rare earth which has been subjected to thermal neutron bombardment in an atomic pile.

Radiation intensity is less than 6 milliroentgens per hour anywhere on the surface of the housing, so that operating personnel can work with the Iso-X continually without exceeding the minimum tolerance dose.

Mag-Electric Tubeless Voltage Regulator

Mag-Electric Products, Inc., of Hawthorne, California, has recently developed a unique line of magnetic amplifier type voltage regulators for both single and variable frequency alternators.

No tubes or moving parts are used in these regulators, and no warm up time is required. The voltage regulators work into the field of the exciter or the field of the generator, thereby eliminating exciter maintenance. They can also be used in series or shunt with the generator output.

The power for the regulator can be derived from an external power source of any frequency from 50 to 1000 cycles or in case of an A.C. generator, from the generator output itself.

These regulators have been used successfully in various applications such as voltage regulation of diesel and gasoline engine driven alternators, voltage regulation of motor generator sets, voltage regulation of inverters, and in the voltage regulation of variable frequency generators.

Seco Portable Tube Tester

A new model of the portable Seco Tube Tester, Model GCT-5, has been developed by the Seco Manufacturing Company of Minneapolis, Minn.

This new Seco tube tester detects the condition of over 40 tubes in AGC, RF, IF and Sync. circuits while

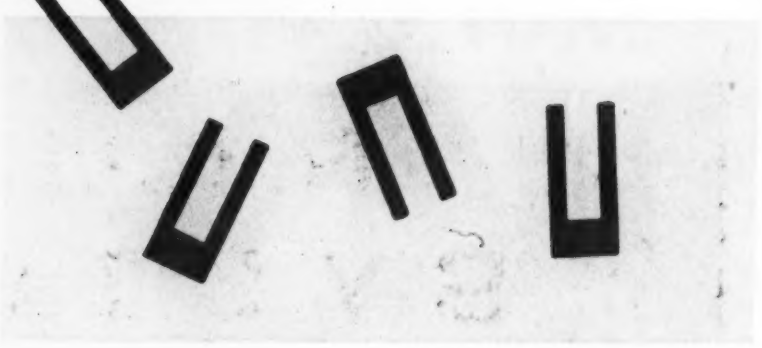
(*Continued on page* 112)

meeting
today's
requirements

MINUTE
SIZE

MAXIMUM
PERFORMANCE

miniaturized DU laminations offer ultra-reliability for precision performance



■ Since military requirements first stressed the vital necessity for miniaturization of magnetic core parts, civilian needs have been growing, and now include transformers for hearing aids, wrist-watch radios and other devices structured through the use of printed circuits and transistors. Magnetic Metals Company is prepared to supply sub-miniature laminations processed from thin alloy strip to engineering specifications.

MAGNETIC METALS COMPANY

ELECTROMAGNETIC CORES AND SHIELDS

HAYES AVENUE AT 21st STREET

CAMDEN 1, N.J.

at the same time permitting customers to actually see the weakness in defective tubes.

Without the use of any selector switch, it is now possible to determine grid to cathode shorts, gaseous condition in tubes, cathode to heater shorts and control grid emission.

The "Seco-Eye" indicator of the tester permits a first-hand demonstration of future tube troubles. Recheck calls are thus minimized; more tubes are sold and service time is reduced immeasurably.

Decker Dynamic Balancing Machine Announced

Decker Aviation Corporation of Philadelphia, Pennsylvania, has announced the development of a dynamic balancing machine.

This new device is capable of measuring and correcting dynamic unbalance of high speed rotors to better than one-one hundred thousandth of an inch-ounce.

To measure and correct unba'ance. a rotor is mounted in a jig provided in the front of the machine. A flashing light indicates when operating speed has been reached, at which time, electric spark marking is used to locate the point of unbalance on the periphery of the rotor.

The plane of unbalance and amount of corrective drilling required are visually indicated. A high precision drill mounted on the machine is controlled by a single lever to drill holes of desired depth which correct the rotor balance.

Howell Sensitive Light Beam Galvanometer

A series of shock resistant light beam galvonometers of exceptional compactness, with sensitivities up to .105 microamperes per millimeter division, has been developed by Howell Instrument Company of Fort Worth, Texas.

Originally developed for use in field servicing and testing of jet aircraft, the Howell Galvanometer is particularly suited to laboratory and industrial production testing services.

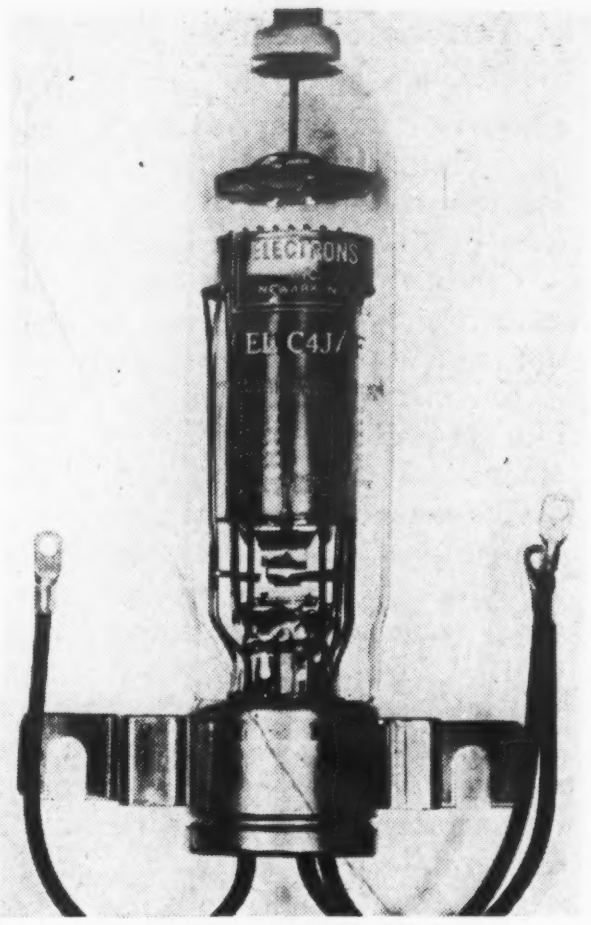
Separately, the movement may be installed as an integral part of other industrial instrumentation in the fields of colorimetry and densitometry, or for measurement of electrical potentials, conductivity, light flux or temperature.

Its compactness is achieved through a folded light beam. The effective length of the light beam is 80 millimeters.

Xenon Filled Thyratrons From Electrons, Inc.

The production of two new Xenon filled thyratrons having identical electrical characteristics has been announced by Electrons, Inc., of Newark, New Jersey.

These new thyratrons are ideal for application in motor control and ignitor firing circuits. The EL C4J is designed for socket mounting; the EL C4J/F for panel mounting wherever conventional sockets might not be desirable.



New Xenon filled thyratron, produced by Electrons, Inc. Shown above is the EL C4J/F, ideal for panel mounting where conventional sockets might not be desirable.

Ratings of both tubes are 4 amperes DC continuous average anode current; 30 amperes oscillograph peak current with maximum peak forward and peak inverse of 900 volts. Average arc drop in 12 volts and heating time is 60 seconds.

Stable grid characteristics are maintained throughout life and the critical grid current is less than 10 microamperes.

Pictured on the left is the fastest, most versatile lens combination in the world today. It includes the Bell & Howell-Angenieux one inch f/0.95, 10mm f/1.8 wide angle, and three inch f/2.5 telephoto lenses for 16-mm cameras. All three may be mounted on the Bell & Howell 70-DL (as shown) and the 200 TA Auto Master motion picture cameras without physical or optical interference, giving the movie maker a 7½ to 1 range of focal lengths (75mm to 10mm). Manufactured by Pierre Angenieux of St. Heand, France, the new lenses will be distributed exclusively by Bell & Howell of Chicago, Illinois.

Kay Electric Oscillator

The "Radaligner," a new two or four band sweeping oscillator being marketed by Kay Electric Company of Pine Brook, New Jersey, provides an instantaneous check of the entire bandpass of any equipment in the 10-169 mc range.

This device offers a choice of four center frequencies for aligning radar IF amplifiers. It also provides a variable marker and choice of 10 narrow, plus type crystal-controlled markers, positioned to specification.

Individual marker circuits provide marks independent of test circuit characteristics. The sweeping oscillators are completely electronic, with no mechanically driven elements.

The Radaligner is designed to eliminate phasing by use of single sawtooth voltage for deflecting the oscilloscope and driving the sweeping oscillator.

(Continued on next page)

ITEMS OF INTEREST

General Corderman Becomes Deputy Chief Signal Officer

Brigadier General William Preston Corderman has been appointed Deputy Chief Signal Officer by Major General James D. O'Connell, who advanced from that post to Chief Signal Officer on May 1.

General Corderman, who has been Chief of the Research and Development Division of the Office of the Chief Signal Officer since June, 1953, has served as acting Deputy Chief Signal Officer during absences of General O'Connell.

Before assuming his present post, he served in many important assignments including Director of Communications for the Alaskan Command; Commanding Officer, Signal Corps Supply Agency at Philadelphia; and Chief of the Engineering and Technical Division in the Office of the Chief Signal Officer.

HOFFMAN ELECTS NEW PRESIDENT

H. Leslie Hoffman, president of Hoffman Electronics Corporation, recently announced the election of Vice Admiral John B. Moss, USN (Ret.) to president of Hoffman Laboratories, Inc., wholly owned subsidiary of Hoffman Electronics.

Mr. Hoffman will retain his same active part in Hoffman Laboratories as chairman of the board, in addition to serving as president and chairman of Hoffman Electronics.

Admiral Moss has been corporate-wide consultant for Bell Aircraft Corporation since his retirement from the Navy in 1953.

Houdek Takes New Post at Kellogg

Joseph F. Houdek, Jr., holder of a number of patents on wire communications apparatus, has been named chief of the General Laboratory, Kellogg Switchboard and Supply Company, Chicago, a Division of International Tel & Tel Corp.

Mr. Houdek, who joined the Kellogg organization in 1941 as a reseach engineer, has served as section head of the company's Research Laboratory since 1951. Prior to that, he was supervisor of the Telephone Research and Development Group.

He is a member of the Armed Forces Communications and Electronics Association, Treasurer of the Chicago Acoustical and Audio Group, and chairman of the Communications Committee, Chicago Section of the American Institute of Electrical Engineers.

NEW PRODUCTS

Kaiser Digital Delay Generator

Kaiser Metal Products, Inc., of Bristol, Pa., has developed a new time discrimination instrument called a Precision Digital Delay Generator.

This new instrument opens up new possibilities for precise measurements in the fields of electronic navigation, digital computers, geophysics and nucleonics.

The significant contribution to the art of time measurement made by this instrument is its ability to provide pulses, precisely delayed in time, with respect to an internally generated reference pulse at any repetition rate.

Of the seventy tubes and their associated circuits, it is the stability of the crystal which contributes to the overall accuracy of the unit. All of the digital circuitry is used only as control elements to gate out the initiating reference pulse, the first delayed pulse, and the second delayed pulse. The unit can also be used as an elapsed time indicator.

Digital circuitry and thermostatic crystal controlled stability permit accuracies of better than .001 microseconds in 1000 microseconds.

Polymer Plastic Core

A new magnetic plastic core with unusually high temperature stability, high impact strength and excellent machinability, has been developed by the Polymer Corporation of Reading, Pennsylvania.

Known as Ferrotron, the new material is expected to serve many specialized purposes in electrical, electronic, radio, television, military and aviation fields.

Extensive tests have shown the core to be heat resistant up to 200°C. This material maintains high impact strength at temperatures as low as minus 100°C.

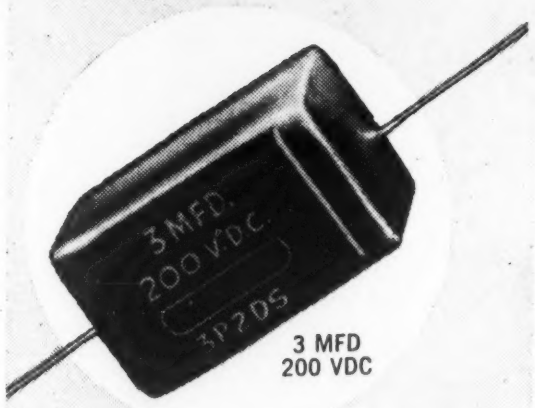
Bulletins Available from International Resistance

International Resistance Company of Philadelphia, Pennsylvania, has recently issued four new bulletins describing its products.

These bulletins are: Bulletin B-8, ½ Watt Molded Deposited Carbon Resistors; Bulletin D-2, Sealed Precision Voltmeter Multipliers; Bulletin SR-3, Varistors (asymmetric nonlinear resistors); and Bulletin T-1, Resistance Strips and Concentric Disc Resistors.

NEW SUBMINIATURE METALLIZED PAPER CAPACITORS

NEW LEAD LOCATIONS AVAILABLE | Axial leads • Radial leads • Single End parallel leads in all capacitor sizes.



- Resin impregnated and rectangular shaped for maximum space conservation.
- Completely encased in a non-nutrient plastic for maximum fungus and humidity protection.
- Operating temperature range −55°C to +100°C.
- Temperature coefficient +.07%/°C.
- Excellent capacity retrace.

A variety of sizes are available. Also, special designed units made to exact specifications.

Also, NEW subminiature HY-THERM CAPACITORS | for all applications requiring exceptionally high insulation resistance and unusual stability at high temperature.

HOPKINS Engineering Co.

Write, wire or phone for details, TODAY!

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Microwaves pioneer new horizons at Sperry

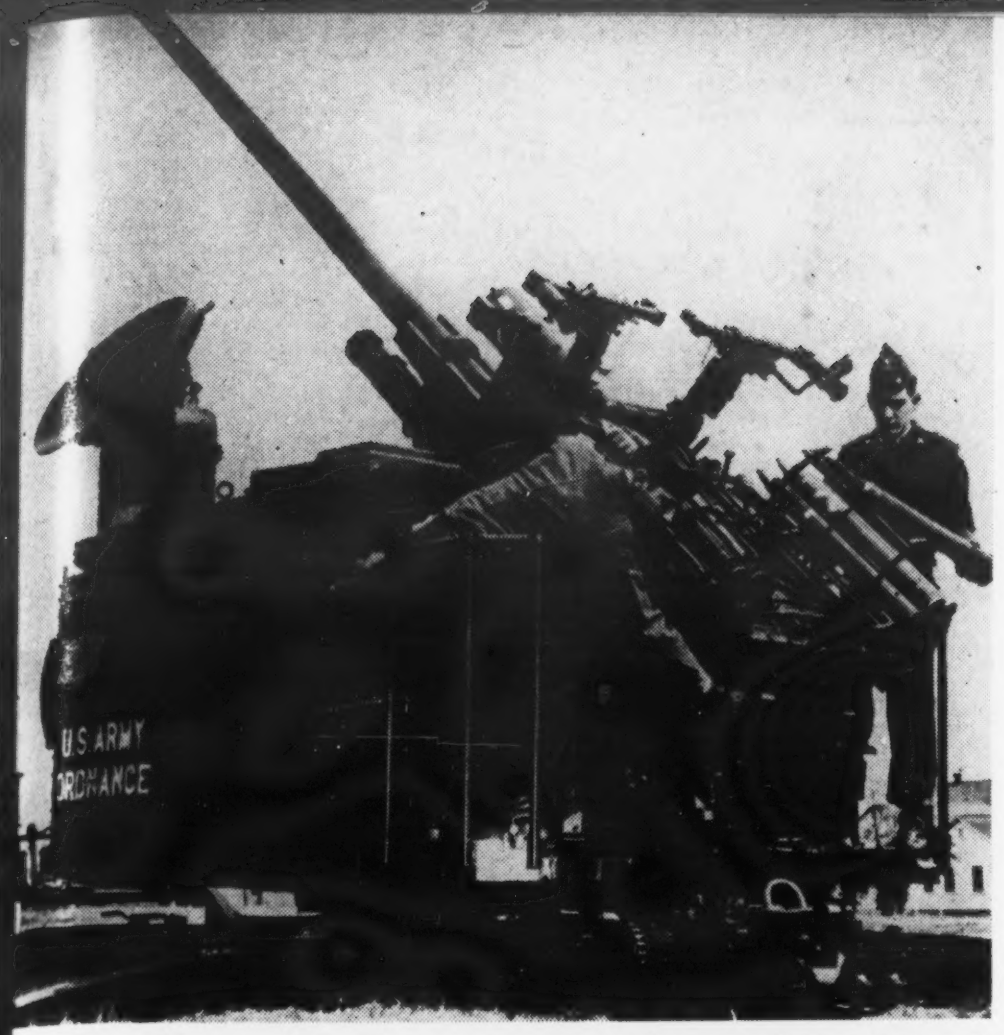
AN ACTIVE PARTNER IN TODAY'S MILITARY MISSIONS, Sperry Gyroscope Company has shared in the opening of military frontiers through its development and production of advanced weapons and military systems over the past 45 years. The handful of engineers and technicians that developed the first automatic pilots, fire control devices, radio controlled pilotless aircraft and guided bombs prior to the first World War, has today grown into a versatile organization of 16,000 producing scores of defense products ranging from basic navigation references and precision instruments to extensive automatic weapons and missile systems.

Among the most fundamental of these developments is the klystron tube introduced in 1938. This first practical means of generating and manipulating useful amounts of microwave power unlocked a vast region totaling more than eight octaves of the radio spectrum for further development of the communications arts. Extension of radio techniques into this entire realm of the spectrum, known generally as the microwave region, had waited several decades for the invention of a suitable generating device. The klystron speeded development of sensitive microwave radars, communications relays, and other microwave techniques common today in missiles, navigation, telemetering, and remote control.

Laboratory and production test computers, as the automatic VSWR recorder shown above, are essential to design and production of highly complex systems containing 200 or more components.

A close-up of a section of the field analog computer shown in full on the next page. This computer calculates and tests precise electron lens designs used in the production of klystrons.

During its early years, the klystron was commonly thought of as capable of only small amounts of power. Other tubes, such as magnetrons, were relied upon to provide the higher power needed for more advanced systems. The klystron, however, progressed beyond this stage many years ago. This became generally known recently with announcement of a new series of klystron amplifiers that generate millions of watts for the most powerful of radars. What was once a struggle for ten milliwatts has grown into today's production of ten megawatts and more.



The "Skysweeper," 75mm automatic radar-controlled antiaircraft weapon, "locks onto an airplane like a bulldog," and destroys it with deadly rapid fire. The electronically-controlled weapon is supported by latest automatic microwave test equipment.

Development of multi-megawatt klystrons is only one indication of the progress in this relatively new electronic art. Exact frequency control, synchrodyne relaying and other critical techniques possible with the klystron have led to its incorporation in virtually every type of modern microwave system.

Along with growth of the klystron's technology, a new industry has come into being to supply precision microwave components and measuring instruments for the host of new systems that thrive today in the microwave spectrum. At the time Sperry began sponsorship of the klystron, a special research group was organized to provide the "ammeters and voltmeters" needed as standards for measuring the performance of the new system applications. From the frequency meters, wattmeters, impedance meters, and other basic instrument devices developed during the past 17 years, an extensive array of entirely new concepts of system tests has been developed to meet the demands of today's complex radars and guidance systems.

The original instrument engineering group is now consolidated into the Support Equipment Study Group of the Sperry Microwave and Electronic Equipment Engineering Department. Charged with studying each new military system at the beginning of development, this group surveys all critical performance parameters of each system and initiates early developments for on-time production of integrated test equipment needed for all phases of system utilization—from laboratory and factory to flight line and field support.

Latest developments stemming from this broad approach to vital support problems include:

- New automatic performance monitors built into each radar system. These system monitors measure the overall system performance figure and give a simple go-no-go indication of system operating tolerance.
- New operational evaluators for missile guidance and radar systems. These devices simulate moving and static targets for checking operational performance of the system in place of full scale test missions.
- New standardized combination test sets. Where five or more tailormade units were needed to test a system, these new compact single-unit test sets are capable of both vidio and r-f measurements and applicable to any system in the band.
- Automatic recording impedance meters. These laboratory and production-line computers, can accomplish one month of tedious design measurements in less than an hour. Capable of reproducing their own design, such devices are vital to more efficient utilization of technical manpower and reduction of production test time.
- New ferrite devices for controlling microwave transmission circuits. This new family of microwave components enables direct electrical control of amplitude modulation, phase shifting, attenuation, isolation, and switching in system waveguides and polyplexers.
- New series of direct reading field test equipment, Cumbersome measurement techniques are reduced to simple meter readings of VSWR, peak power, and other complex factors by means of rugged portable units. The peak power meter is the first practical instrument capable of direct measurement of peak power at microwave frequencies.
- New high-directivity couplers. These units enable convenient automatic VSWR measurements in long line systems.

Operational results of computers used at Sperry cut design time by eliminating trial and error construction of working test models of klystrons.

RADIO INTERFERENCE and FIELD INTENSITY *Measuring Equipment*

COMPLETE FREQUENCY COVERAGE—14kc to 1000mc!

VLF

HF

NM-10A 14kc to 250kc

Commercial Equivalent of AN/URM-6B
Very low frequencies

NM-20B 150kc to 25mc

Commercial Equivalent of AN/PRM-1A
Self-contained batteries. A. C. supply optional. Includes standard broadcast band, radio range, WWV, and communications frequencies. Has BFO.

VHF

NM-30A 20mc to 400mc

Commercial Equivalent of AN/URM-47. Frequency range includes FM and TV bands.

UHF

NM-50A 375mc to 1000mc

Commercial Equivalent of AN/URM-17. Frequency range includes Citizens Band and UHF color TV Band.

Send for free bulletin entitled "Measurement of RF Attenuation"

Inquiries invited concerning pads or turrets with different connector styles

PRECISION ATTENUATION TO 3000mc!

TURRET ATTENUATOR featuring "PULL-TURN-PUSH" action

FREQUENCY RANGE: dc to 3000 mc.
CHARACTERISTIC IMPEDANCE: 50 ohms
CONNECTORS: Type "N" Coaxial female fittings each end
AVAILABLE ATTENUATION: Any value from .1 db to 60 db
VSWR: $<$1.2, dc to 3000 mc., for all values from 10 to 60 db
$<$1.5, dc to 3000 mc., for values from .1 to 9 db
ACCURACY: $\pm$0.5 db
POWER RATING: One watt sine wave power dissipation

Single "IN-THE-LINE" ATTENUATOR PADS and 50 ohm COAXIAL TERMINATION

STODDART *Aircraft Radio Co., Inc.*

6644-H SANTA MONICA BOULEVARD, HOLLYWOOD 38, CALIFORNIA • HOLLYWOOD 4-9294

Early Experiences with Global Short Wave

THE YEAR 1925 SAW ZENITH RADIO Corporation make notable commercial progress and exert profound influence on the future of communications and development of American broadcasting.

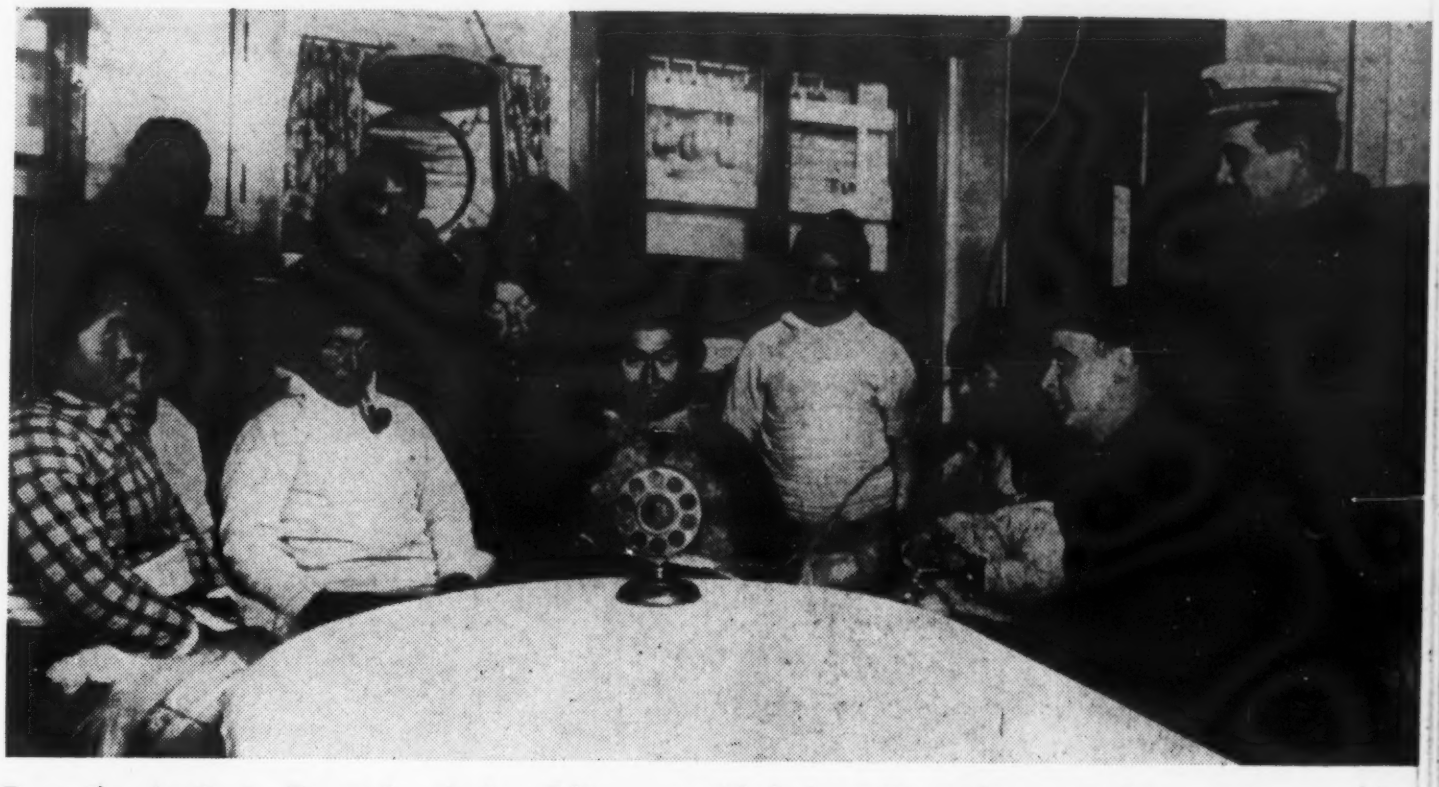
At that time radio equipment on naval and merchant vessels the world over was long wave. It covered good distance at night, but during the day even powerful stations were out of touch with other ships and with shore stations at distances of only a few hundred miles. Nevertheless, the experts disdained short wave radio, which had been assigned to amateurs as a plaything.

In 1925 the U. S. Fleet scheduled a goodwill tour to New Zealand, Tasmania and Australia. That same year, Commander Eugene F. McDonald, Jr., president of Zenith, was scheduled to go north on the MacMillan-National Geographic Arctic Expedition.

McDonald persuaded Admiral Ridley McLean to put shortwave radio to the test by commissioning a young amateur, Fred Schnell (who later served in World War II as a Navy Captain), and sending him along on the cruise aboard the USS *Seattle*, flagship of the fleet.

That settled, McDonald turned his attention toward the new MacMillan expedition. He selected the S.S. *Peary*, a sturdy 160 foot ship, equipped it with Zenith shortwave transmitting and receiving gear. When the MacMillan-National Geographic Expedition headed north in the spring of 1925, McDonald was skipper of the *Peary*, and second in command of the expedition, in charge of the naval aviation personnel that had been assigned to the expedition by President Coolidge.

When the expedition sailed, it left behind the heavy, long wave transmitting and receiving equipment supplied by the Navy, for the simple reason that this gear could not provide long distance communication during the continuous daylight of the Arctic summer. But as they neared



From the Arctic to Tasmania, singing Eskimos provided dramatic evidence of short wave radio's potential for the world's navies. This experiment by Commander Eugene F. McDonald, Jr. (right) led the way in opening up once "useless" radio frequencies. Commander Donald B. MacMillan, the Arctic explorer, is seated at right.

Nova Scotia they were overhauled by a fast destroyer, pulled into Sydney, and ordered to install the useless equipment as protection for the naval personnel on the expedition. This long wave radio gear did not send or receive a single message while in the Arctic. It couldn't span the long distances involved during the 24-hour Arctic daylight.

Short wave, however, soon gave dramatic proof of its value. Putting in at Disko Island to refuel, McDonald was told by the local Danish governor that permission would have to be received from the Danish Minister in Washington. He regretted that their long wave radio transmitter could not get a message out in daylight, but could do nothing about it until night fell. This was in June, and night would not come until September.

McDonald needed coal, so he turned to his short wave rig, and enlisted the services of an amateur radio operator near Washington. Four hours later he had his permission from the Danish Minister.

In the meantime, the U. S. Navy Fleet was on its way across the Pacific. With his short wave "pin box radio" Schnell kept direct contact with American amateurs long after the Fleet's high-powered, long wave equipment had lost daytime contact. He also communicated directly with the *Peary*, as it sailed north toward Greenland.

The MacMillan expedition reached Etah, Greenland, only eleven degrees from the North Pole, while the USS *Seattle* was off the coast of Tasmania, 12,000 miles away. The Fleet's long wave equipment could not even maintain direct contact with the American continent at this great distance. But Schnell communicated directly by short wave, not only with American amateurs, but with the MacMillan Expedition as well. McDonald clinched the demonstration by putting a group of Eskimo singers before the mike, and sending their voices to Admiral Coontz on the *Seattle*, almost exactly half the world away.

That was the start of practical use of short wave radio by the U. S. Navy. The other navies and merchant marines of the world soon followed.

It is interesting to note that ALL of radio's expansion into new channels since that date — international communications, ship to shore, VHF and UHF television, radar, etc.—has been in this once "useless" wave band of 200 meters and less.

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This story originally appeared in "The Zenith Story," copyrighted by Zenith Radio Corporation.

TERMINATION
Prestige Radio Co., Inc.
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Toroids Exclusively at

Burnell & Co.

A COMPLETE LINE OF FIXED AND variable toroidal inductors, audio filters, and similar networks are manufactured by Burnell & Co., Inc. of Yonkers, New York, for applications in communications and electronics. This company was among the first to specialize exclusively in the manufacture of toroids and related products. By supplying to its customers products of a consistently high standard of quality to meet ordinary needs, by meeting difficult or unusual specifications when required, and by pioneering in new and improved types of components, Burnell has kept its place among the leaders in its field.

Burnell toroids are made in a wide range of inductance values, for frequencies from the low audio region up to two or three megacycles. The coils are supplied in many different finishes, from high-temperature wax coating through molding in plastic to hermetic sealing to meet military specifications. If required, cores of special alloys and multiple windings and taps can be provided.

In addition to the basic toroids, Burnell manufactures networks embodying toroids, such as band pass, low pass, and high pass filters for single side band communication systems, multiplex telegraphy, frequency shift teletype, separation of voice and range signals in aircraft communications and numerous other applications. Delay lines, discriminator transformers, and phase-critical filters (for sonar and servo systems) are among the more special types of networks manufactured by this company.

Other Burnell filters are used in radar, computers, data processing systems, measuring instruments, microwave communication systems, in miniature telemetering equipment and guided missiles.

A recent Burnell development of extreme interest to equipment designers is a new type of variable inductance toroid, the Rotoroid (patent applied for). Without the use of an external supply, the Rotoroid provides a maximum-to-minimum inductance ratio of at least four-to-one (plus or minus 60% of the nominal value). Variation of inductance with shaft rotation is approximately linear over a wide range, high Q is maintained at all inductance values, and non-linear distortion of the signal is minimized.

Change of inductance in the Rotoroid is caused by a biasing field produced by two U-shaped permanent magnets between which the toroid is mounted. Rotation of one of the magnets produces a variation in the strength of the biasing field and thus in the incremental inductance of the coil.

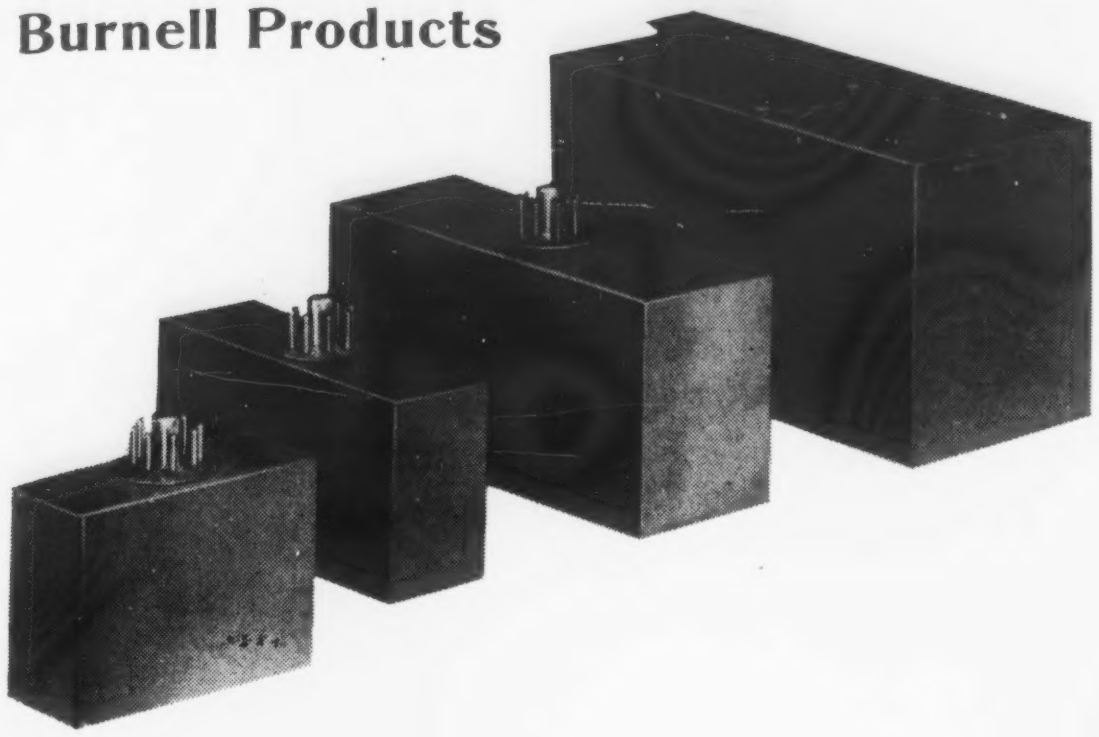
Although the Rotoroid is a comparatively recent development, variable inductors of this type already are available in a wide variety of sizes and types. They are manufactured in standard and subminiature sizes and the same range of inductance values as the standard Burnell toroids. Special cores, additional windings, and taps can be supplied. Two or more Rotoroids can be ganged and will track within 1% in frequency.

Various special types of Rotoroids are now being developed in the Burnell laboratories: Rotoroids using special core materials to achieve either positive or negative temperature coefficients; power Rotoroids for high-current applications at low audio frequencies, and subminiature Rotoroids.

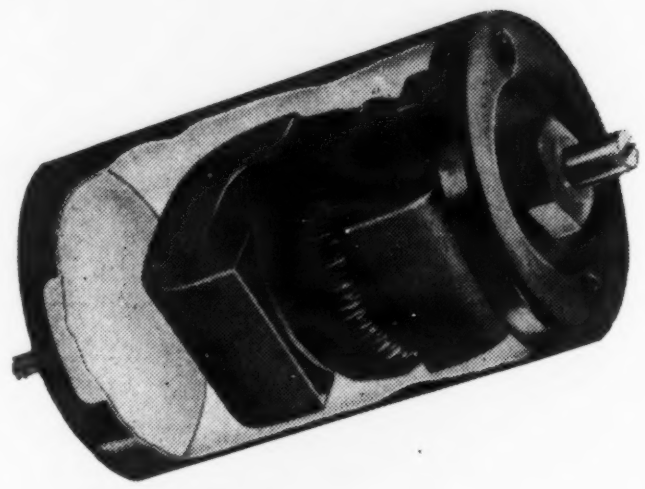
A recent modification of the Rotoroid is the Adjustoroid, in which the inductance variation is limited to 10% of the nominal value. Although they provide sufficient inductance variation to be useful for many purposes, Adjustoroids cost very little more than fixed toroids.

The development of the Rotoroids and Adjustoroids has opened up for designers in the field of communications and electronics many new possibilities in equipment performance; in so doing, it has further strengthened the already strong position of Burnell & Co., Inc.

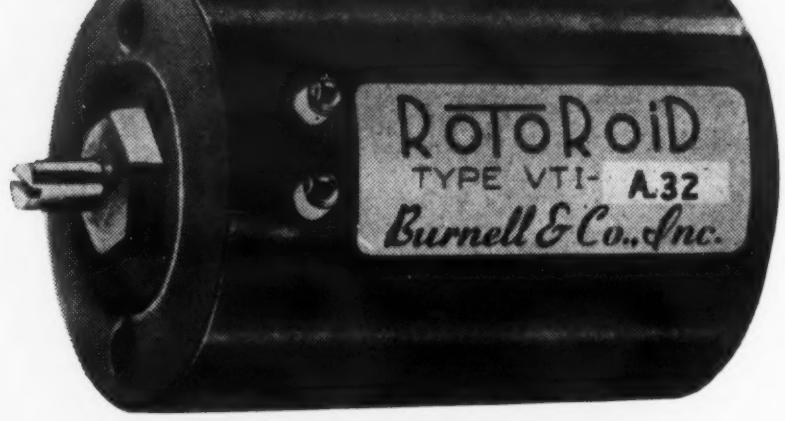
Burnell Products



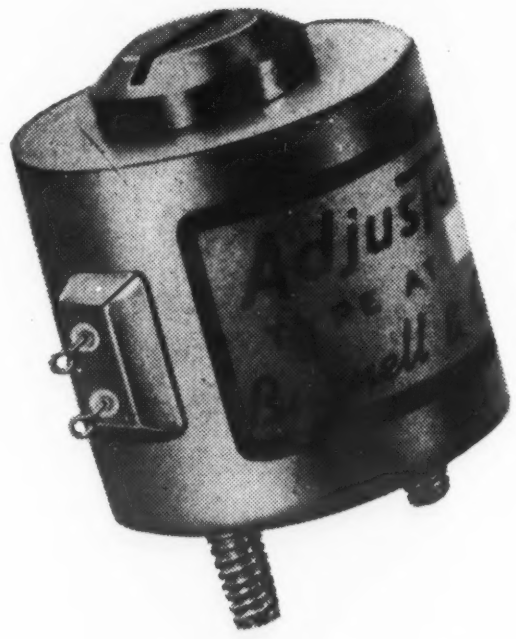
External view of Burnell toroidal inductance networks in standard and subminiature sizes. These networks are designed to meet almost any requirement in communications and electronics.



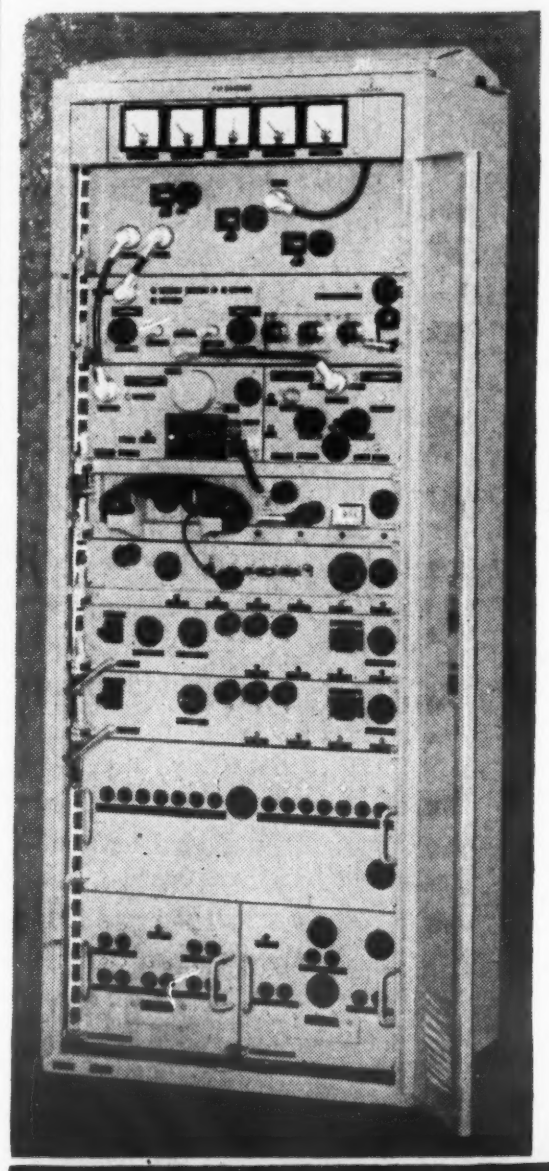
The principle of the Rotoroid, although novel, is simple, as shown above in the internal view of the Rotoroid. Simplicity produces reliable, troublefree operation.



The Rotoroid, a new type of variable-inductance toroid, combines high Q with stability, linearity and simplicity.



The most recent Burnell development in toroids is the Adjustoroid, for applications requiring only a limited amount of inductance variation.



SIXTY-CHANNEL UHF FM RADIO SYSTEM OF ADVANCED DESIGN

Type FM60/2000 Radio System transmits up to 60 voice channels in a frequency range of 1700 to 2300 mc. Transmitting power is 5 watts and a single antenna is employed for both transmitting and receiving. The maximum frequency swing is 0.5 mc, and the transmitted frequency band is 12 to 252 kc. A similar system type FM60/300 operating in the frequency band 235 to 328 mc is also available. These radio systems operate in conjunction with the type F60 carrier-telephone system, which provides up to 60 3400-cycle telephone channels in 5 12-channel groups.

A complete FM60/2000 Radio Terminal requires a single cabinet.

RADIO ENGINEERING PRODUCTS
1080 UNIVERSITY STREET, MONTREAL 3, CANADA
Telephone: UNiversity 6-6887 Cable Address: Radenpro, Montreal
MANUFACTURERS OF CARRIER-TELEGRAPH, CARRIER-TELEPHONE AND BROAD-BAND RADIO SYSTEMS

Final assembly work is done on the amplifiers for installation in the USS Forrestal. Stromberg-Carlson shipboard announcing systems have been installed in both the USS Forrestal and the USS Nautilus, atomic powered submarine.

New Shipboard Announcing Equipment

SHIPBOARD ANNOUNCING equipment provided by the Stromberg-Carlson Company for the USS *Forrestal*, and the USS *Nautilus*, embodies the latest advances in circuitry and construction and insures operation under the severest conditions.

Extremely high amplification requirements had to be met by the equipment for the *Forrestal* because of the normally high noise level, particularly on the flight deck. To fulfill those requirements, a separate system for flight deck announcing consists of 12 power amplifiers, providing a total of 6000 watts of audio output. This amplification is designed to provide a sound level of 109 db on the flight deck—high enough to be heard over the roar of jet planes during takeoff. The flight deck announcing system is controlled from any one of five microphone-control stations from which voice announcements can be made, and an additional number of stations from which alarm signals can be operated.

In addition to the flight deck announcing system, the USS *Forrestal* also has a general announcing system providing two circuits for shipboard communication, with a total audio output of 2000 watts. One of these circuits, for aviator's announcing, is connected to only two groups of loudspeakers—the flight deck walkways, and the hangar deck walkways. This circuit has 8 microphone control stations.

The other circuit, for general shipboard communication, has 6 loudspeaker groups, including the two on the Aviator's announcing system, and four others designated as officers, crew, engineering, and spare. This circuit has 9 microphone control stations, from which messages can be transmitted to any or all of the loudspeaker groups in both circuits. Both circuits can be used separately and simultaneously if a control point in the general shipboard communication circuit does not call for use of the loudspeaker groups in the Aviator's announcing system. However, if both circuits are activated from a general announcing control location, this station takes priority over stations in the aviator's announcing system.

The shipboard announcing equipment on the USS *Nautilus* consists of a single system having two circuits, with 125 watts of audio output per circuit. One of these circuits provides for the general transmission of announcements or orders from any one of five microphone stations to loudspeakers in all areas of the ship. The other circuit provides for two-way communication between 18 microphone locations. Both circuits can be used from the Bridge, and voice signals from the Bridge take priority over all other voice signals.

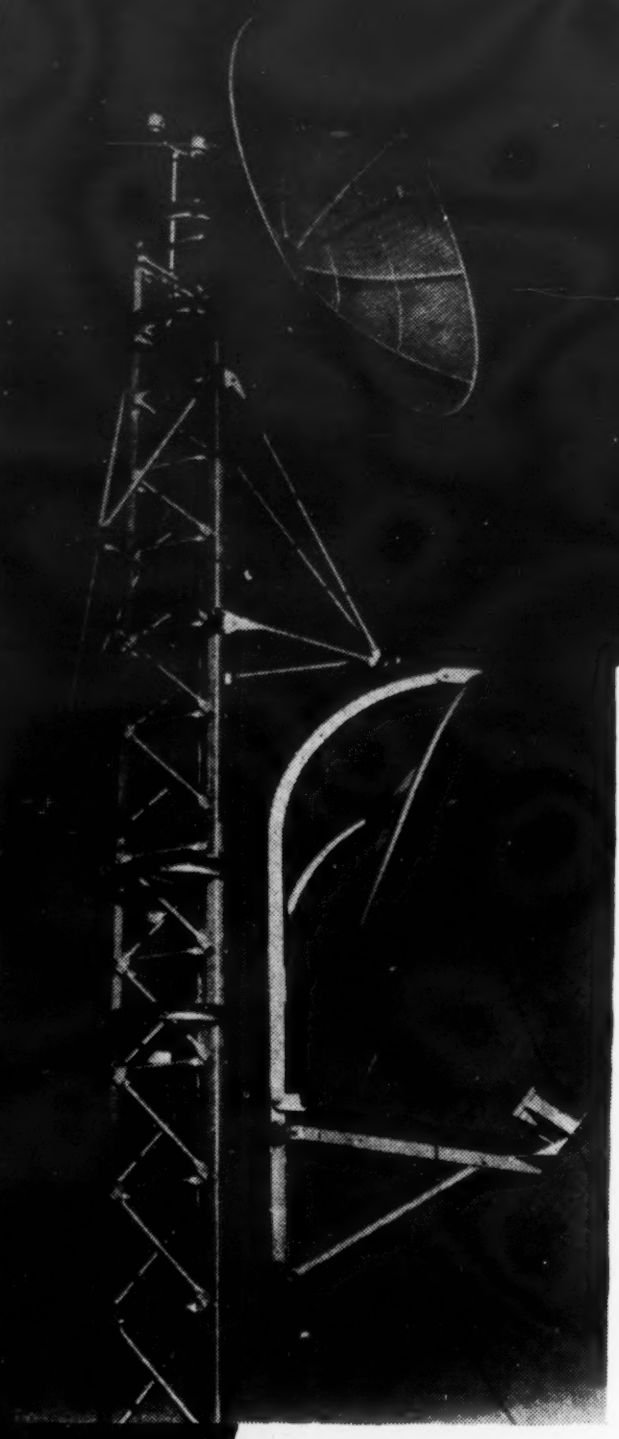
The equipment also includes oscillators for the generation of four alarm signals on the USS *Forrestal*, and three on the USS *Nautilus*, which may be sounded from any of a number of alarm stations in the ship. The order of precedence of the alarm signals is controlled automatically by the equipment. Such controls also give all alarm signals priority over all voice signals.

Each microphone control switch in all the circuits is equipped with a relay which automatically cuts out the loudspeaker in that immediate vicinity to prevent feedback.

Amplifiers in the system include limiter and compressor circuits which provide automatic volume control on all voice signals, but which do not affect alarm signals.

All of the components contain parallel tube circuits, and many of the other components, such as oscillators, also are in duplicate to insure continued operation of the equipment in the event of failure of some of its parts.

Communications equipment on the USS *Forrestal* also includes 16 Stromberg-Carlson amplifiers for sound-power telephones. These amplifiers provide 7½ watts of audio output for loudspeakers at gun positions, and also supply amplified voice signals for up to 6 headset phones at each gun position.



In use throughout the world . . .

ANTENNA SYSTEMS

BY Prodelin

FOR MORE THAN 10 YEARS, Prodelin has been a prime developer and supplier of communications equipment for both government and commercial applications. Today, Prodelin antennas, towers and transmission lines are serving our own and friendly governments throughout the world.

TOWERS

Prodelin's semi-portable aluminum microwave towers are currently in use in Europe and in North and South America. Triangular aluminum sections are both rugged and light in weight. Towers are simple to erect, easy to climb and require little or no maintenance.

ANTENNAS

Prodelin has been awarded various antenna development and production contracts from federal, state and foreign governments. Its antennas are available for virtually every government service. Antenna types manufactured by Prodelin are TV broadcast, center-fed parabolic, offset feed, cavity feed, corner reflector, horn, yagi and colinear stacked arrays.

"G-STRING"

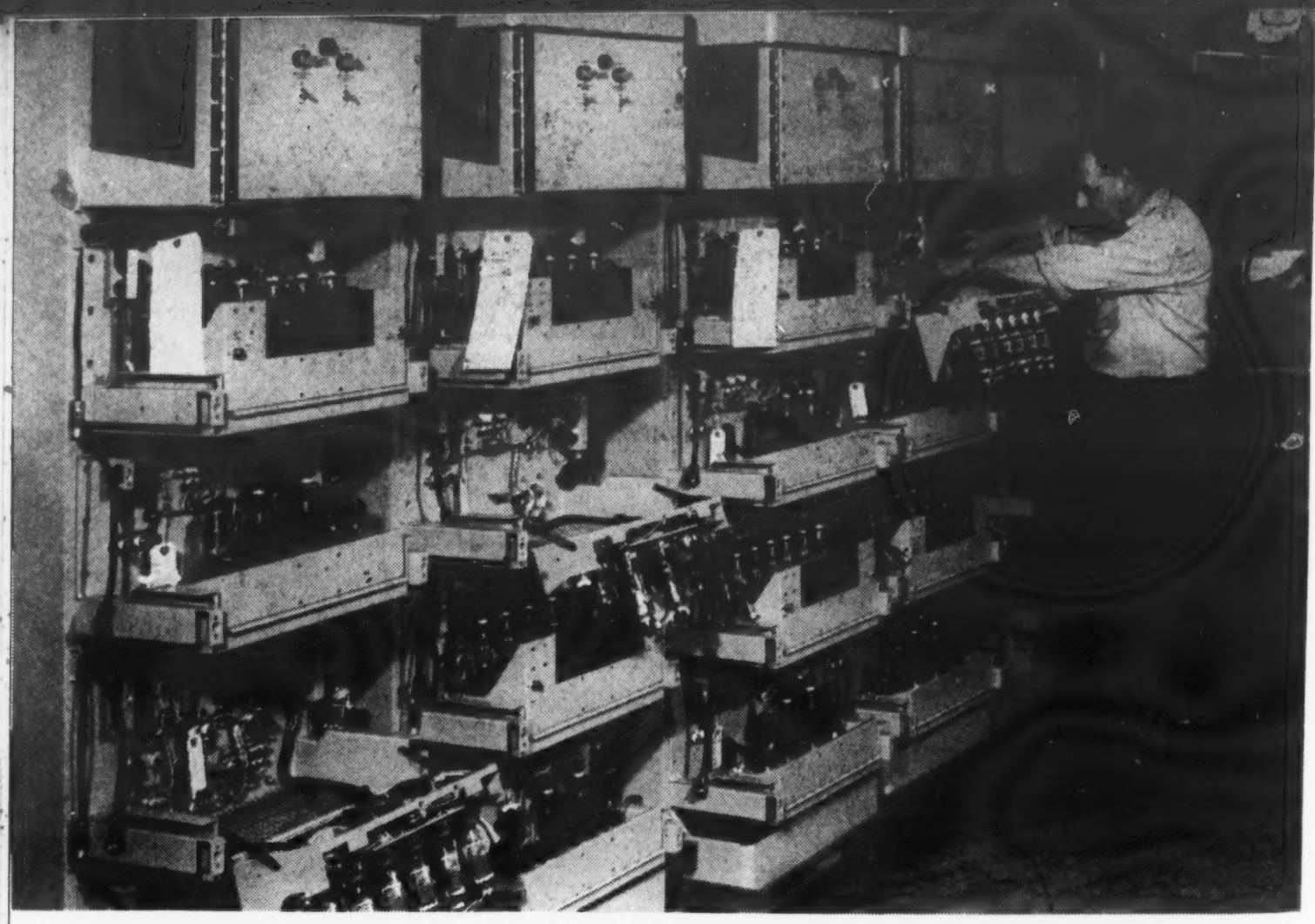
One of the most recent government projects (AN-TRC/29) at Prodelin, the "G-String" surface wave transmission line assembly is used to transmit RF frequencies from 1700-2400 mcs.— transmitter to antenna. Entire assembly consists of 2 launching units, transmission lines, RF and power cables, de-icing equipment and associated hardware.

TRANSMISSION LINES

Prodelin is the government's first supplier of series 800 broadband air dielectric coaxial cables. Since 1945 Prodelin has continued to expand its line of waveguide and coaxial transmission lines, adapters, fittings, etc., so that today Prodelin is capable of supplying transmission line system components for virtually every government service up to 3000 mcs.

Whatever your project may be, if it entails the use of antennas, towers, transmission lines or RF filters, for high or low power, consult Prodelin first. Ten years of development, manufacturing and field experience in microwave, VHF-UHF television services are your assurance of low cost, trouble-free system performance.

Prodelin Inc **307 BERGEN AVENUE, KEARNY, N. J.**



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Prodelin Inc **307 BERGEN AVENUE, KEARNY, N. J.**

Thousands of these precision-built Hallicrafters receivers have proved their value with outstanding performances around the world.

hallicrafters for "hams"

GLOBAL COMMUNICATIONS FOR THE amateur, in a fashion never before possible, are being offered this year by The Hallicrafters Company, Chicago electronics manufacturer, through its new and improved line of communications transmitters and receivers.

Leading the company's array of equipment is the brand new HT-30 transmitter which offers single sideband AM and CW transmission. This unit provides a full 50 watts of peak power output, highly stable VFO and maintains the unwanted sideband at least 40 db down and undesired beat frequency down 60 db and more.

An equally high caliber receiver is Hallicrafters' new SX-96, a double conversion selectable sideband model which offers major improvements in stability by the addition of temperature compensation in the high frequency oscillator circuits and the use of crystal controlled second conversion oscillators. The company's highly selectable 50 kc. i-f system is used in this set. It employs ten tubes plus a rectifier and voltage regulator and covers the standard broadcast band from 538 to 1580 kc and three short wave bands from 1720 kc to 34 mcs.

Other new models which have just been introduced and are already proving highly popular with "hams" include the SX-99, a short wave receiver featuring over 1000 degrees of calibrated bandspread, the S-53 A, a receiver designed to provide maximum performance in a minimum of space, and the S-38 D, a new and improved version of Hallicrafters' popularly priced S-38 C. This latter receiver covers standard and three short wave bands and features an oscillator for code reception and an electrical bandspread.

In addition to this long range equipment, Hallicrafters again this year offers an improved version of its "littlefone", a two way portable hand-carried radio telephone. This instrument is proving increasingly popular with police and fire departments, Civil Defense organizations and industry generally. The littlefone has as much as a two mile range on the ground in industrial areas and is effective even when employed in structures of reinforced concrete or steel. When used in aircraft, the same portable unit has a range up to 125 miles.

According to Bill Halligan, Jr., Hallicrafters' director of marketing for communications equipment, the new line represents a continuation of the policy on which the company was founded in 1933, that of manufacturing "ham" equipment that would more than meet the exacting requirements of the "hams" themselves at prices which they can afford to pay.

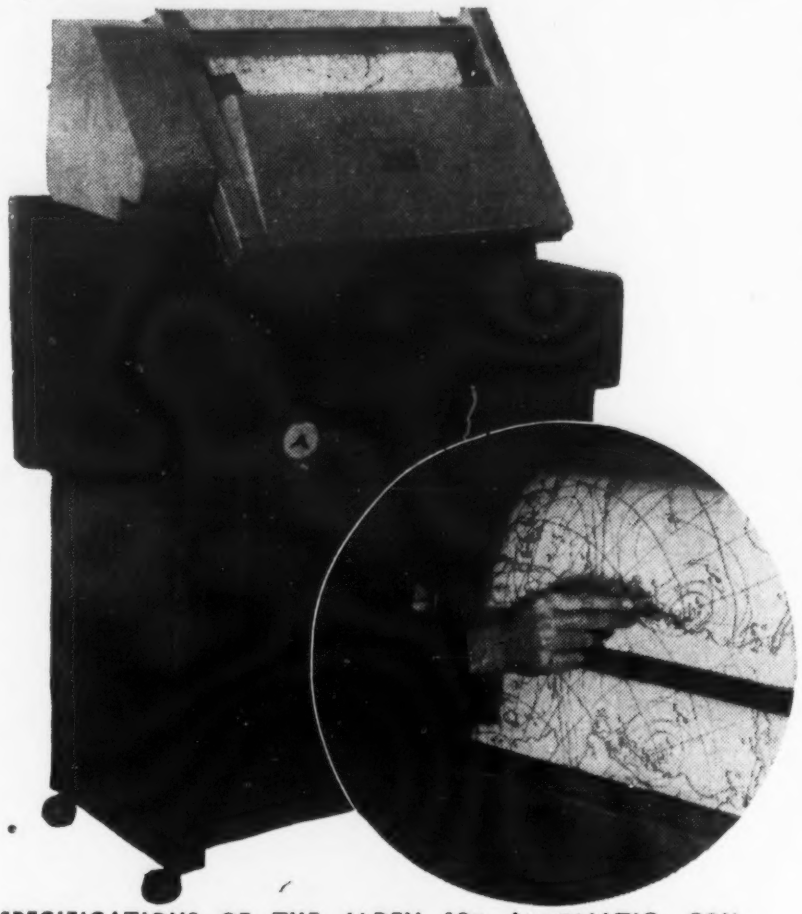
From this humble beginning, Hallicrafters has grown to be a primary communications equipment supplier to the armed forces, and for the general public, a leading manufacturer of communications, home radio, television and high fidelity equipment.

William J. Halligan, Jr. Director of Marketing for the Communications Division of The Hallicrafters Company.

Central station "Littlefone."

NEW HORIZONS IN INSTANTLY VISIBLE, DIRECT RECORDING FACSIMILE NOW OPENED BY ALFAX PAPER AND ALDEN ADJUSTERLESS RECORDING TECHNIQUES

New Alden Facsimile Equipment designed for quantity production provides flat copy scanning of unlimited sizes of copy, and continuous, automatic, unattended operation of recorders.



SPECIFICATIONS OF THE ALDEN 19″ AUTOMATIC, CONTINUOUS WEATHER MAP RECORDER

OPERATION: Recorded line 18.850″. Paper Advance .6 inches/min. with automatic or manual fast paper advance. Automatic Start, Stop responding within 22 seconds to Weather Map signal. Control Timer allows pre-set selection of operation time. Power 110 volts, 60 cycle.

CONSTRUCTION: Recorder and electronics furnished in desk top cabinet on roll away casters 55″ high, 32″ wide, 22½″ deep—or recorder and electronics can be placed separately. All electronics on plug-in chassis with front panel "tell tales" for quick, visual operation monitoring.

PAPER: Alfax Type "A" Paper in 100 foot rolls, 19⅛″ paper width.

PRICE & DELIVERY: Available on rental or direct sales basis.

WITH Alfax Paper providing a new wide range of tone responses faithful to the amount of current passed at both very slow and very high recording speeds with little current consumption, entirely new possibilities in the field of direct, visual facsimile recording have been opened up. This paper, wedded to new Alden adjusterless recording techniques to provide the optimum recording pressures and accuracies for fullest utilization of Alfax paper, makes possible new facsimile recorders that operate on a continuous automatic basis to provide facsimile recording systems that are the fastest, most accurate means of getting information over transmission lines today.

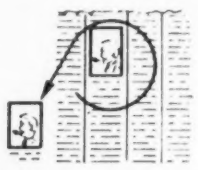
The first recorders are now available with circuitry completely compatible for facsimile weather map networks. Called the *Alden 19″ Automatic Continuous Weather Map Recorder,* this equipment rolls into an installation, plugs into weather map network line and immediately provides fully automatic and continuous weather map recording for weather personnel. This personnel has been tremendously pleased to merely load paper once for 30 hours of automatic, continuous operation; they like the ability to draw, make notes, and erase on the clear, white background of the Alfax maps—to quickly and clearly see weather map changes by superimposing maps against a lighted background—and to get additional copies at any time by using these maps for Ozalid or Bruning type reproduction. They find Alfax maps can be filed and stored indefinitely without loss of definition or fading of the recorded marks.

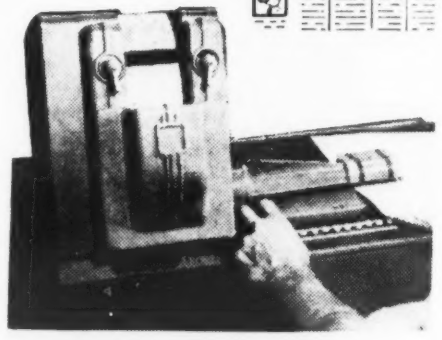
ALDEN 19″ FACSIMILE REPRODUCTION SYSTEM

For business and communication use the *Alden 19″ Facsimile Reproduction System* is readied for production. High quality pictures, complete advertising layouts, blueprints and drawings can be sent with this system. The Alden 19″ Flat Copy Scanner takes any size copy, flat or folded, by merely slipping it under a roll on the scanner and it is automatically recorded by the Alden 19″ Automatic Continuous Recorder. Designed to operate at speeds suitable for present telephone lines, this system is designed to be used for high speed duplication or transmission at 15 times the speed over closed loop or microwave circuits.

ALDEN HIGH SPEED SELECTIVE DISPATCH SYSTEM

Small Copy Selectively Scanned from larger copy.





Specially designed to permit selection of pertinent data from any copy—letters, dispatches, and reports — the Alden High Speed, Selective Dispatch System is ideal for sending vital bursts of information and commands —yet it can send complete reproduction of any copy in strip form. Dependent upon the type transmission system used, speeds up to 72 square inches (900 typewritten, 1800 newspaper type words) per minute are practical. A complete transmitting and receiving station can be installed in a regular business desk, using only 18″ x 28″ of the top and none of the drawer space.

THE ALDEN GIANT BULLETIN RECORDER

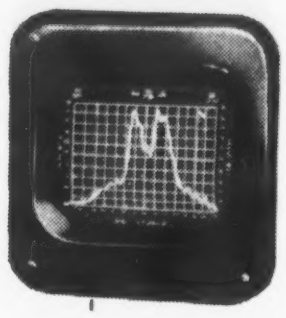
For briefing pilots, military personnel or informing passing traffic and crowds with late bulletins and emergency information, the Alden Giant Bulletin Recorder issues up to the minute bulletins 5′ wide and up to 10′ high — enlarged ten times from original copy, and supplemented by sound if desired from a remote flat copy scanner. For indoor or outdoor use — can operate under extreme weather conditions.

ALFAX TYPE "A" PAPER

All the above equipment and techniques have been made possible by Alfax Type "A" electro sensitive paper. This remarkable paper, for which electricity is the ink, is the first electrosensitive paper to combine so many desirable factors:—it is stable, has low current requirements, its recordings are permanent, paper quality is high, and suited to high or low speed recording. Its great range of tone scales makes it superior for the transmission of photographs, for the plotting of Sonar and Radar pulses, and opens a new field of simple, fact-finding recorders. Write for Alfax brochure: "Recording with Alfax."

Write for full information and specifications on any of the above equipment.

ALDEN ELECTRONIC AND IMPULSE RECORDING EQUIPMENT CO., WESTBORO, MASS.



PANORAMIC

LEADS THE WAY

IN **SPECTRUM ANALYSIS** FROM

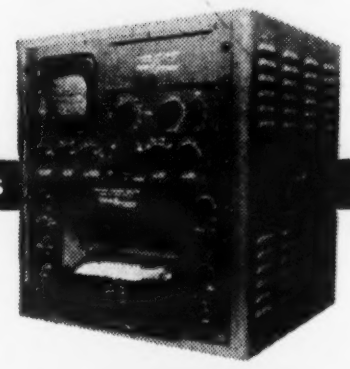
SUB-SONIC THROUGH **MICROWAVES**

Pioneers in the field of spectrum analysis . . . through the years Panoramic has demonstrated leadership . . . and Panoramic Instruments have been proven unexcelled for research development and production applications requiring accurate, high-speed spectrum or waveform analysis.

Whatever your problem, from sub-sonic through microwave analysis, there is a Panoramic analyzer to answer your needs. Operation is simple and reliable. Design and construction are the finest. Many models are used in military applications.

Day in and day out, Panoramic instruments play a vital part in monitoring communications channels . . . telemetering . . . interference analysis . . . vibration and sound studies . . . transmitter analysis . . . FM deviation measurements . . . microwave spectrum analysis . . . servo analysis.

Inquiries invited for development of special Panoramic analyzers.



SUB-SONIC WAVEFORM ANALYSIS • 0.5 cps—2000 cps

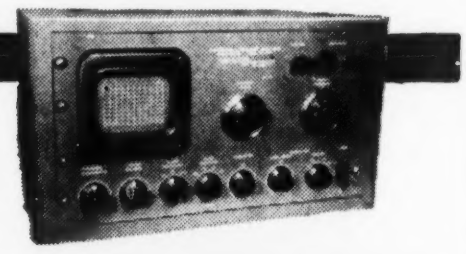
Panoramic Sub-sonic Analyzer, Model LF-1

features 0.5 cps resolution, 40 db amplitude range, high sensitivity, permanent spectrum recordings.

AUDIO FREQUENCY WAVEFORM ANALYSIS • 20 cps—20 kc

Panoramic Sonic Analyzer, Models LP-1 and AP-1

feature direct reading waveform analysis in only one second, 60 db dynamic range, simple operation.



ULTRASONIC WAVEFORM ANALYSIS • 1 kc—300 kc

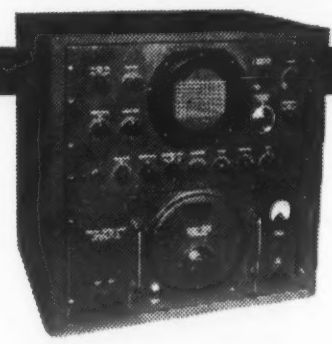
Panoramic Ultrasonic Analyzer, Model SB-7a

features continuous variable scan width 0-200 kc, continuously variable resolution 2 kc — 500 cps, direct reading frequency and amplitude scales.

RF, VHF and UHF SPECTRUM ANALYSIS

Panalyzer, Model SB-8b and Panadaptor, Model SA-8b

Each model available in three types with maximum sweep widths of 200 kc, 1 mc, and 10 mc, and maximum resolution of 50 cps, 200 cps, and 9 kc respectively. Numerous other models and types also available to suit practically every special need.



MICROWAVE SPECTRUM ANALYSIS • 50 mc—4000 mc

Panoramic Spectrum Analyzer, Model SPA-1

SENSITIVITY: up to —100 dbm; SWEEPWIDTH: 10 mc continuously reducible to 0 mc· RESOLUTION: 9 kc — 100 kc, continuously variable; SCAN RATES: 1 cps — 60 cps, continuously variable; FREQUENCY COVERAGE: tuning heads RF2 50 — 250 mc and RF3 220 — 4000 mc.

the pioneer is the leader

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RADIO PRODUCTS, INC.

Write today for complete technical data and prices.

15 S. Second Ave., Mount Vernon, N.Y. • MOunt Vernon 4-3970

USAF Strategic Communications System

(*Continued from page* 35)

matic switching equipment is programmed to replace this semi-automatic equipment in the U. S. and is programmed for some overseas stations.

Messages are received at the switching centers on typing reperforators, which produce a printed, perforated, chadless tape.

The need for replacing this with automatic equipment is evident when one considers that the ever increasing speed of aircraft, together with increasing message traffic volume, will continue to exert more and more emphasis on speed of service, accuracy, and the need for more efficient utilization of available circuits and personnel.

While several automatic relay devices were considered, such as magnetic tape, magnetic drum, high speed facsimile, and telespot, it was decided that automatic reperforator switching devices were the most practical for use in the USAF Strategic Communications System since the device to be employed had to be compatible with teletype operation.

The automatic switching center is composed of a group of identical self-contained incoming line consoles interconnected by cables terminated in multi-conductor plugs and sockets, and a group of identical self-contained outgoing line consoles similarly inter-connected. These two groups of equipment were linked together by cross-office switching circuits over which messages are transmitted at two-hundred words per minute.

These two basic groups of equipment contain all of the switching means required for manual operation of the relay center. The building block principle, thus obtained, enables a center to be expanded or contracted as circumstances dictate with a minimum of disturbance to the existing installation. Each console is equipped to provide for the switching of messages to one-hundred destinations and two-hundred circuits. With the addition of automatic switching directors, on a ratio of one per each 25 incoming line positions, fully automatic operation is provided.

The automatic switching center will be capable of employing incoming and outgoing circuits, operating at sixty, seventy-five or one-hundred words per minute and any combination thereof.

Military requirements for the automatic switching center equipment have been agreed upon, approved and adopted for joint usage by the three military services.

Technical Problems

Numerous problems confronted the Air Force in the planning and implementation of the Strategic Communications Systems. Some of the non-technical difficulties were acquisition of real estate, delivery of equipment and spare parts, and construction of buildings.

Some of the technical problems were design of buildings, design of antenna, selection of the optimum equipment, and the clearing of frequencies.

As far as these problems are concerned, the Air Force is, generally speaking, in pretty good shape. However, there are several things the Air Force needs in order to have a truly efficient and reliable communciations system.

For instance, there are no black boxes available that would transform our radio circuits into completely reliable means of communications. To minimize the vulnerability of our circuits to interference, we have located our key stations in low absorption areas and installed back-up equipment which can provide higher power in the event of jamming. Recognizing the fact that well

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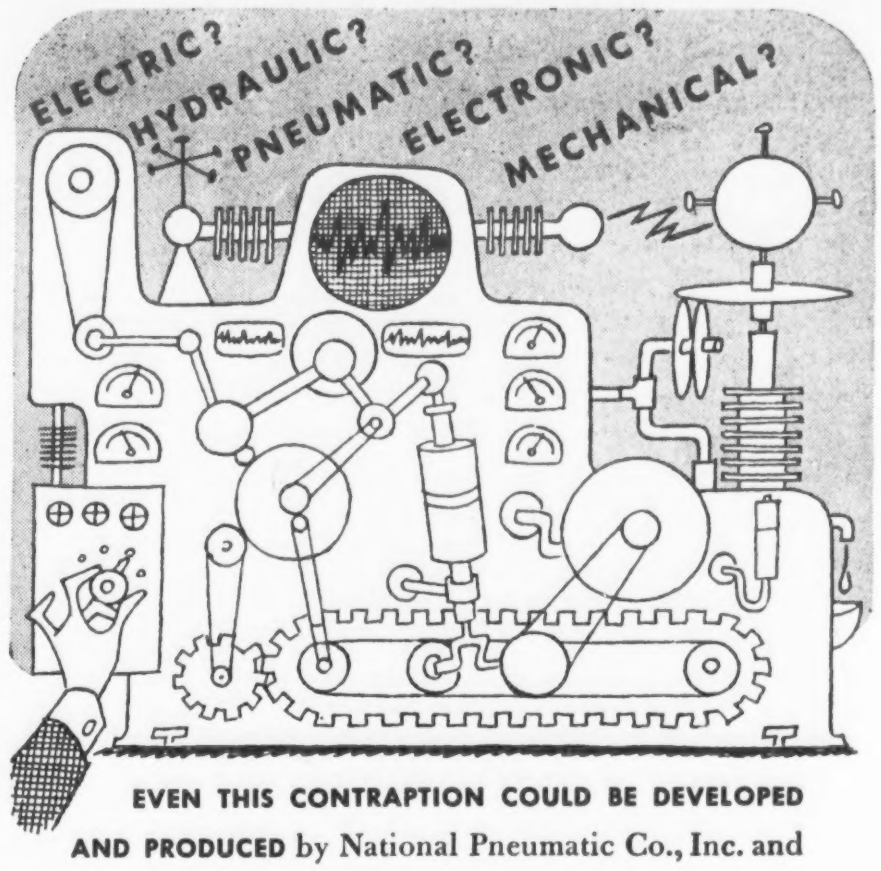

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Diplomatic Communications

(*Continued from page* 31)

State communication center, terminating specially established Signal Corps circuits, was operated at the conference site, with local U. S. Air Force facilities providing backup. These arrangements kept available commercial circuits free for expeditious handling of high volumes of urgent press and other traffic. Direct patches were made between the Conference site and the White House and State Department in Washington.

Electrical communications channels are supplemented by the worldwide U. S. Diplomatic Courier Service which keeps about 70 couriers almost continually on the move. Traveling primarily by air these men pick up and deliver sealed pouches from and to the principal missions and many of the consular establishments at intervals varying from daily to biweekly. Practically all posts are visited by a courier at least once each month. To the maximum extent possible material is diverted from telegraphic channels into the Diplomatic Pouches, when expected transit times will permit.

On-the-Spot Action

One recent illustrative case of the importance of communications to diplomatic negotiations was the service rendered the present Under Secretary Herbert Hoover, Jr. while working in the Near East on the complex oil problem. Mr. Hoover required, and got, fast around-the-clock contact with London and Washington during his delicate negotiations. At the successful conclusion of his mission Mr. Hoover gave recognition to the part played by communications in the conduct of the mission.

The center of diplomatic communications activity is quite logically just around the corner from Secretary Dulles' office in Washington. The communication center is a full relay station together with its associated plain language and cryptographic terminals; it is a Major Relay Station on the world-spanning ACAN, providing outlets to all military trunks serving areas in which the Department utilizes military communications; it is connected directly with the three United States commercial carriers in Washington through whose facilities many missions are reached; the leased circuits to Europe are terminated here and in addition it is equipped with TWX and international TEX (connecting with the European TELEX network) service.

Operating 24 hours a day, utilizing every means of transmission at its command, the State Department communications network is prepared to provide rapid, secure and economical service to any part of the world as a vital service to America's international diplomacy.

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The Next Issue of SIGNAL

will feature the report of the 9th Annual AFCEA Convention, plus outstanding articles on: the New England skilled textile workers' unemployment problem and its solution in Lawrence, Massachusetts; the progress of educational television; the first of a series on communications and electronics in Air Force commands.

USAF Strategic Communications System

(*Continued from page* 125)

trained operators are of great importance in the reduction of circuit vulnerability, all personnel are being educated in the proper selection of type of transmission, equipment to be used, and proper operating techniques.

In peacetime, the Air Force must maintain the ability to handle the impact of the sudden increase in traffic load which would occur in the first few days of war, with a minimum effect on manpower and still be error-free and ungarbled.

Through exercise, periodically there has been placed on the network the amount of traffic that is believed will exist during an emergency. Through these exercises has been found a critical weakness—the man behind the machine. If, in order to meet the sudden surge of wartime traffic, this operator is placed on an 84 hour week, the error rate increases due to fatigue, despite the compelling urge of the operator to do a good job.

It is difficult to usefully employ in peacetime the number of communications center personnel required to handle this initial wartime volume. However, some means of communications must be developed that will eliminate from the communications system those factors which produce errors, and provide a flexible, high capacity communications system capable of handling a highly variable load with a minimum fluctuation in manpower requirements.

The Air Force feels *that some form of facsimile can satisfy this requirement.* A system with continuous feed transmitters and continuous recorders can handle the volume. It will also reduce the errors of transmission and manual reproduction. The Air Force is trying out several forms of facsimile on test circuits to get some experience, realizing that bandwidth will impose a serious limitation.

Recognizing also that it may not be necessary or desirable to convert all record communications to facsimile, the Air Force continually is improving the reliability and speed of teletype. The need for compatibility with other Services and with other countries has a bearing on the limits of such a conversion.

The Air Force is interested in the development of various types of "reading" machines. These machines would take the place of the tape cutter. A message typed in one of the standard fonts would be placed in the machine. The machine would read the text and activate a typing reperforator which would cut the teletype tape. This machine would be far more accurate than a human tape cutter. Although it may be expensive, it is compatible and normal teletype methods can be used to transmit the message over the Air Force teletype circuits. Some manual processing would still be required in perforating the routing and address elements of the heading.

And, finally, one of the major problems is manpower. As systems get faster and more reliable, the machinery gets more complex. This creates a problem of maintenance and training. Once trained, retaining the man becomes another problem. This in turn increases the recruiting and training problem, and so it goes.

The Air Force does not feel it has found the ultimate for its part of the military communications system. It does believe, however, that it has the optimum arrangement, considering the state of the art, the requirements of the air operations, and the limitations imposed by manpower, geography, economics, and the frequency spectrum.

- - - — - —

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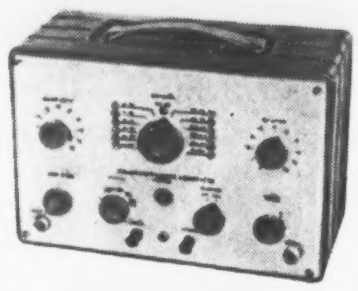
Supplies a fundamental frequency rf carrier of crystal accuracy for alignment and trouble-shooting electronic equipment operating from 19 to 260 Mc. Built-in crystal calibrator, heterodyne detector, amplifier and speaker provide 96 crystal calibrating beats at 2.5 Mc intervals over entire tuning range. Adjustable dial pointer, plus dial marks at every 0.25 Mc point, facilitate accurate setting between crystal check points. $242.50* including rf output cable.



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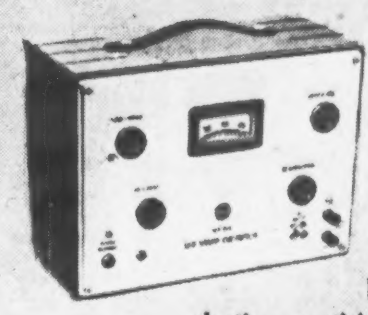

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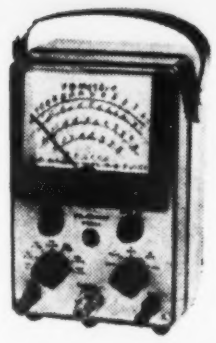

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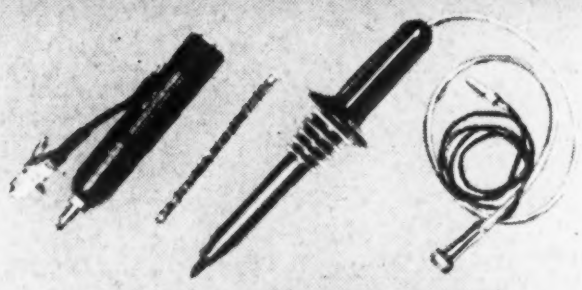

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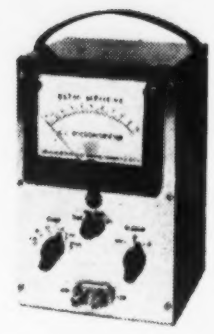

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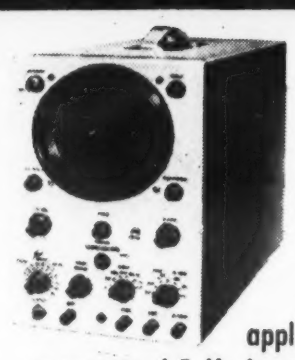

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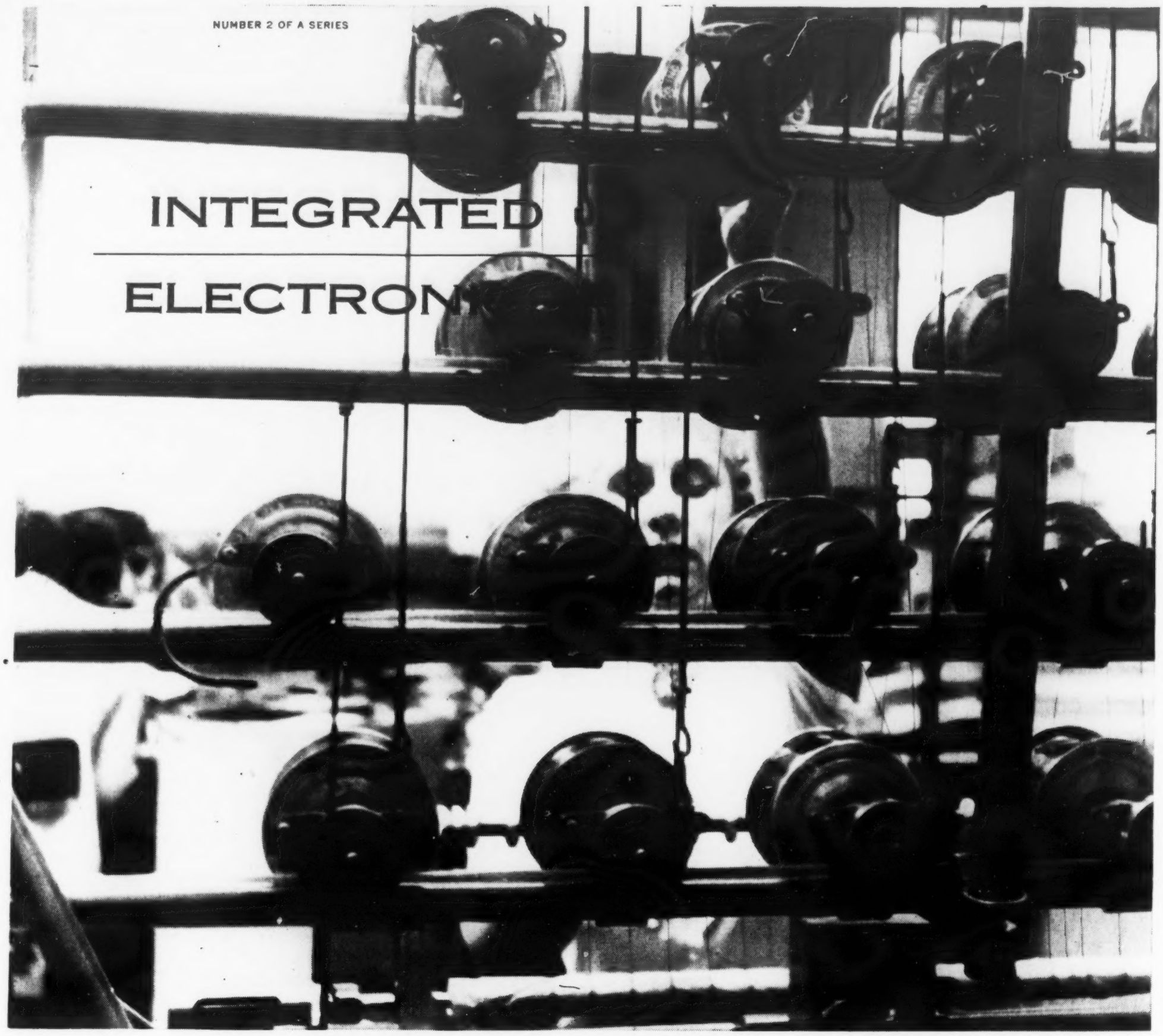

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